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[54] **METHOD AND APPARATUS FOR SELECTIVELY PROCESSING PAGINATED OUTPUT**

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[22] Filed: **Jun. 11, 1990**

Related U.S. Application Data

[63] Continuation of Ser. No. 257,218, Oct. 13, 1988, abandoned.

[51] **Int. Cl.**[5] **G06F 15/40**

[52] **U.S. Cl.** **364/518**

[58] **Field of Search** 364/518, 521, 522, 523; 358/311

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[57] **ABSTRACT**

A data processing system for processing planar-oriented computer output data to provide customized output for each user. The system, called phaser, specifies two-dimensional portions of such planar-output for processing to permit page-oriented editing of the planar output. Portions of pages can be identified by column and line numbers, by box and block coordinates, and by matching plane-oriented patterns. Prior to processing, such varied page specifications are converted to segment lists of line segments to permit uniform processing. Phaser statements are compiled and executed in working sets which can be invoked in series or in parallel (on the same data input) to permit union and intersection operations.

6 Claims, 4 Drawing Sheets

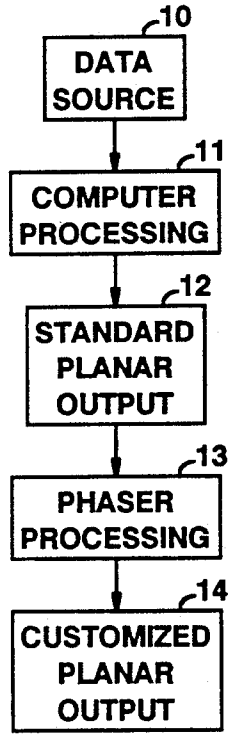


FIG. 1

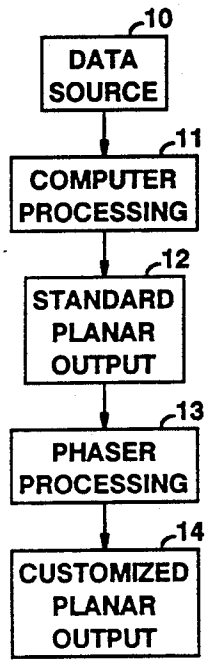


FIG. 3

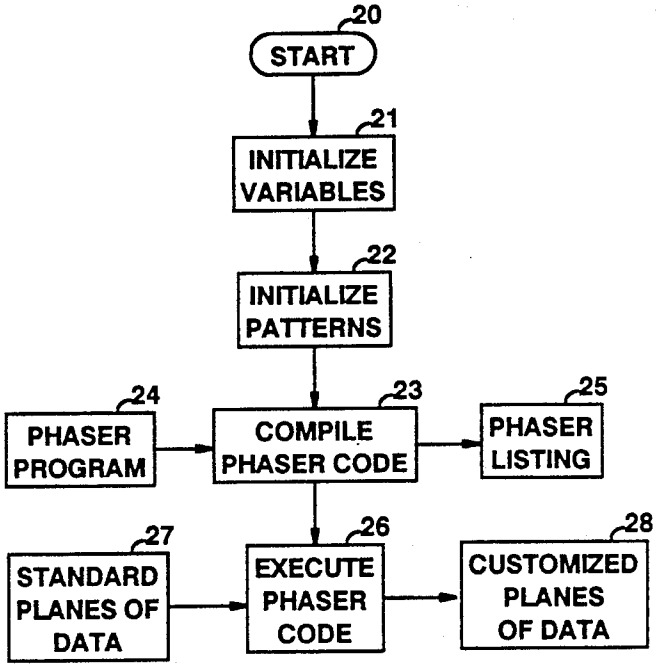


FIG. 2

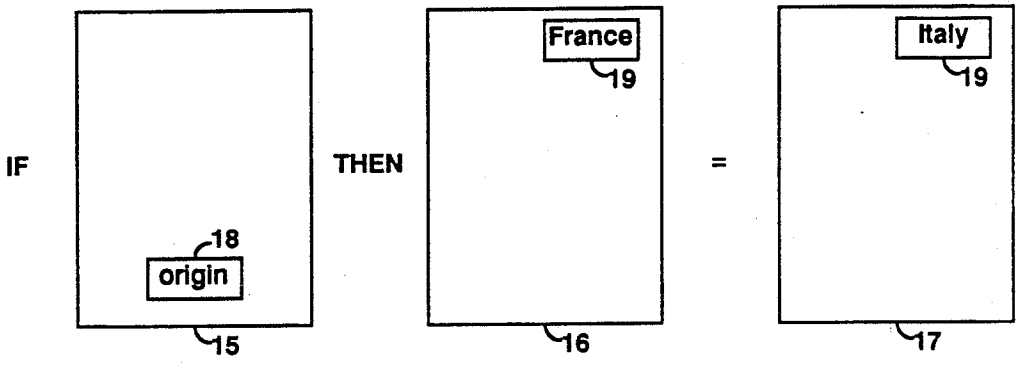


FIG. 4A

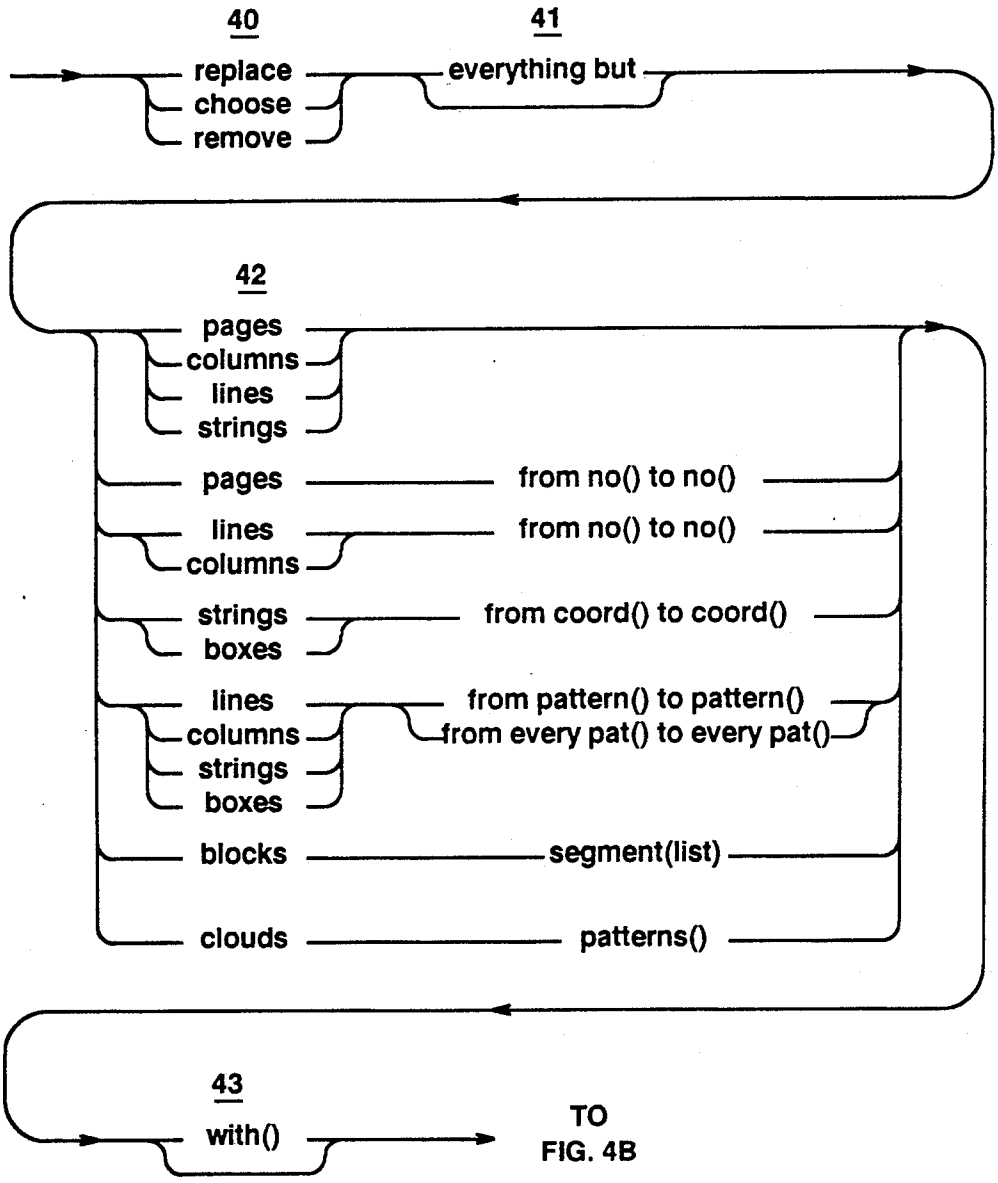

40
41
replace
choose
remove
everything but
42
pages
columns
lines
strings
pages
from no() to no()
lines
columns
from no() to no()
strings
boxes
from coord() to coord()
lines
columns
strings
boxes
from pattern() to pattern()
from every pat() to every pat()
blocks
segment(list)
clouds
patterns()
43
with()
TO
FIG. 4B

FIG. 4B

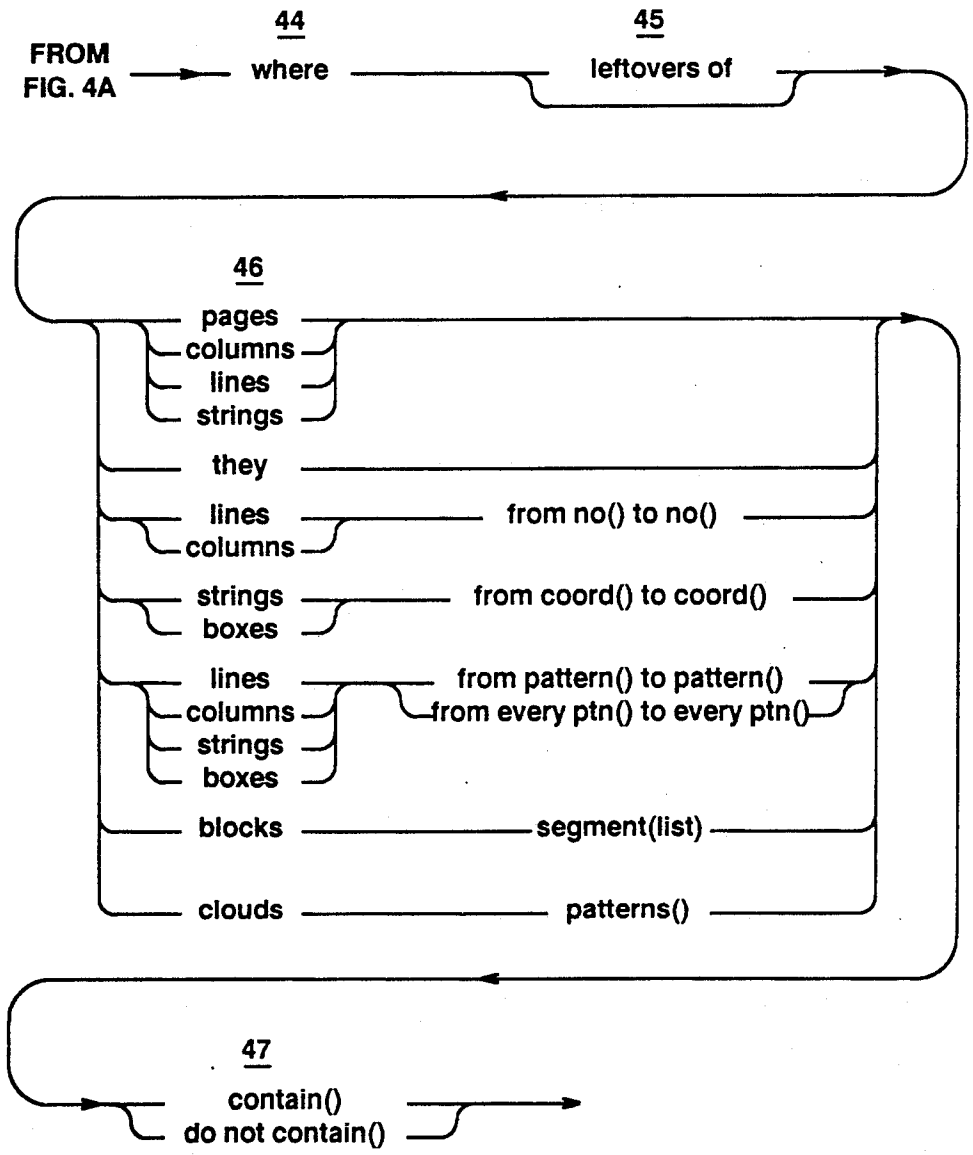
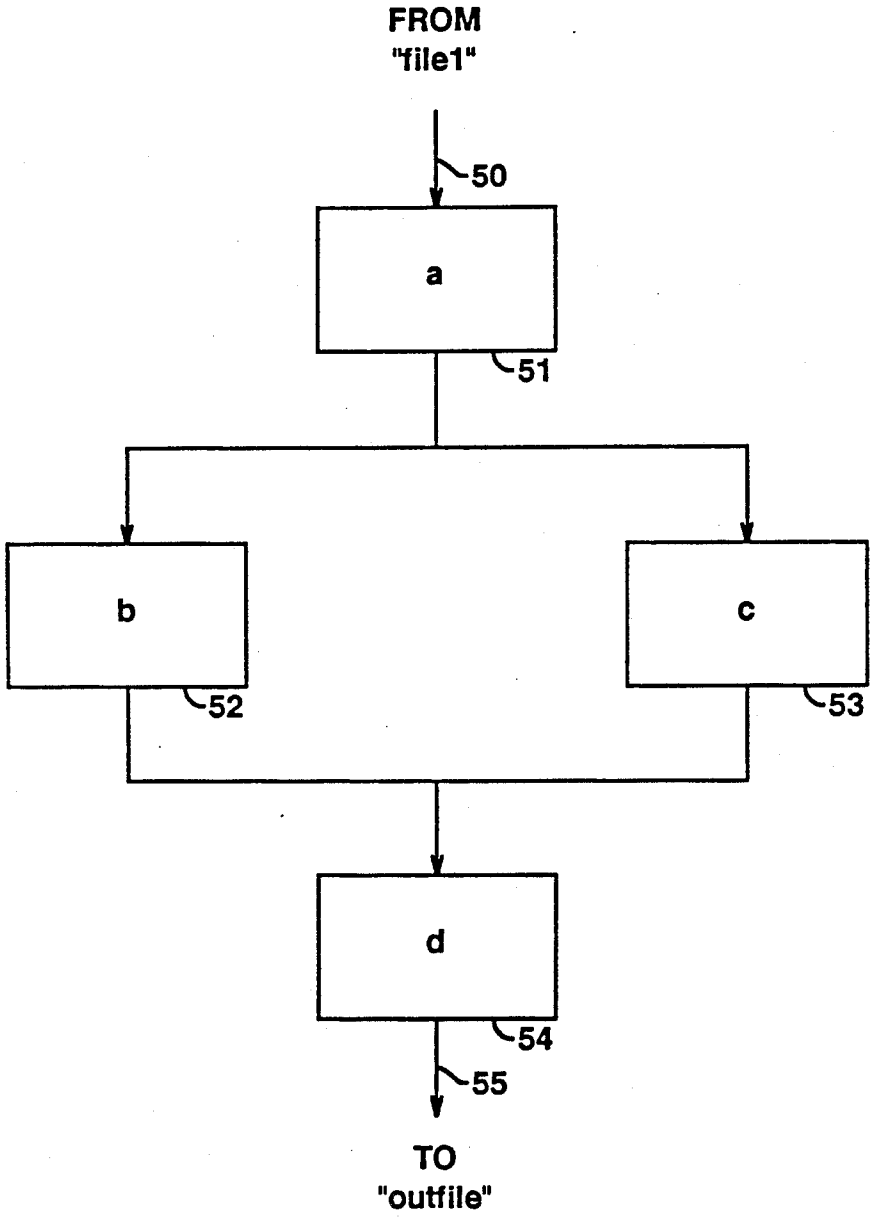

FROM FIG. 4A
44
where
45
leftovers of
46
pages
columns
lines
strings
they
lines
columns
from no() to no()
strings
boxes
from coord() to coord()
lines
columns
strings
boxes
from pattern() to pattern()
from every ptn() to every ptn()
blocks
segment(list)
clouds
patterns()
47
contain()
do not contain()

FIG. 5



METHOD AND APPARATUS FOR SELECTIVELY PROCESSING PAGINATED OUTPUT

This application is a continuation of application Ser. No. 07/257,218, filed Oct. 13, 1988, now abandoned.

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TECHNICAL FIELD

This invention relates to digital data processing and, more particularly, to the selective post-processing of paginated output from digital data processing systems.

BACKGROUND OF THE INVENTION

Many digital data processing application programs in use today produce output in the form of a sequence of two-dimensional images or planes, exemplified by the printed page or the display on a cathode ray tube. Typical examples of such application programs include word processing programs, spread-sheet programs and data base manager programs. The contents of these images include all of the information obtained from the operation of the application program, arranged or formatted in a manner believed to be useful by the application programmer. Some limited ability to control or edit these output images are sometimes included in the application package. Unfortunately, however, such alternate output formats must be provided either by laborious, line-by-line manual editing of the original output, by hard coding of the new format by the application programmer, or else a large and complex report generator must be included in the application program to allow the user to format his or her own output.

The major disadvantage of the inflexible output format is that it sometimes serves to conceal rather than reveal the desired data, due either to the sparsity of the desired data among the total data output, or due to the indirect manner in which it is displayed. The disadvantages of report generators associated with application programs are the time and difficulty in learning how to use the report generator, only to find that it is then necessary to learn a new report generator for a new and different application program. The disadvantages of manual editing are obvious.

SUMMARY OF THE INVENTION

In accordance with the illustrative embodiment of the present invention, these and other problems are solved by providing a general purpose application program output post-processor system which permits the user to selectively format, process and display portions of the data contained in a series of two-dimensional images for display or for printing. The post-processing system in accordance with the present invention (hereinafter called "phaser") is independent of the application program with which it is used and hence can be used with a wide variety of different application programs.

More specifically, the post-processing system of the present invention looks at the two-dimensional plane-oriented outputs from any application program and selectively identifies one or two-dimensional portions of those outputs either by pattern content, or by location on the page. That is, information is located either by the content of the information, or by line and character offset (column) location on the page. It should be noted that the patterns and/or the physical locations need not be contiguous. In order to permit common processing of data identified by these different locators, they are both converted to a single descriptor form, for example, lists of line segments. Such a "segment list" can then be used to control the processing of the data so identified to permit the selective display, replacement or omission of the described data. In particular, data located by pattern matching, for example, is converted to line segment location and placed on the segment list in line segment format.

The plane-oriented post-processing system of the present invention therefore can process the data identified in the segment list by deriving other data from the data identified on the segment list, or merely displaying the identified data in any desired format.

A major advantage of the output-oriented post-processing formatter of the present invention over the data-oriented, pre-processing formatters of the prior art is the ability to use the same formatter for many different application programs, from word processing programs to data base managing programs, and from spread-sheet programs to information retrieval programs.

BRIEF DESCRIPTION OF THE DRAWINGS

A complete understanding of the present invention may be gained by considering the following detailed description in conjunction with the accompanying drawing, in which:

FIG. **1** shows a general block diagram of a page-oriented computer application program system showing the post-processing phaser formatter in accordance with the present invention;

FIG. **2** shows a graphical example of the type of post-processing that can be done on paginated output using the phaser system of the present invention;

FIG. **3** shows a more detailed block diagram of the phaser post-processing page-oriented processing system in accordance with the present invention;

FIGS. **4A** and **4B** show graphical representations of the syntax diagram for a compilation procedure that can be utilized in the phaser system of the present invention; and

FIG. **5** shows a flowchart of an illustrative phaser procedure showing the ordering of working set routines.

To facilitate reader understanding, identical reference numerals are used to designate elements common to the figures.

DETAILED DESCRIPTION

In FIG. **1** there is shown a general block diagram of a computer system in which the present invention can be used. The system of FIG. **1** includes a data source **10** which supplies the data to be processed by the computer system of FIG. **1**. Typically, such data sources are located on magnetic disks, usually after being assembled from large numbers of data generating stations such as point-of-sale terminals, banking terminals, business inventory control stations, and so forth. Data from source **10** is supplied to a standard computer processing system **11** which performs well-known types of computer processing steps on the data from source **10**. A typical result of such processing is the generation of a plurality of "pages" of output. In this context, the term "pages"

includes successive cathode ray tube screen images, or any other two-dimensional, planar output, as well as printed pages. Such output can be categorized as standard planar output **12** from computer processing system **11**. The major problem with such output, as anyone who has had to deal with it fully understands, is that the specific data the user requires is most often buried somewhere in a very large volume of data, spread over a large number of possibly non-successive pages of data, the majority of which is not of interest to that user. It is to the solution of this problem that the present invention is directed.

In accordance with the present invention, the standard planar output **12** from the computer processing system **11** is applied to a special post-processing system **13**, hereinafter called the "phaser" processing system. The function of the phaser processing system **13** is to analyze the planar output from block **12**, to select the portions of that output desired by the present user, to further process such selected portions, if required, and to display the results of such further processing, along with whatever portions of the original output are desired. The result of the operation of phaser processing system **13** is customized planar output **14** which includes all of the data wanted by the user, and only the data wanted by the user, reformatted and further processed in exactly the manner wanted by that user. Other users of the same standard planar output **12** can use the same phaser processing system **13** to provide another, different customized output **14** suitable for the other user's needs.

In the prior art, it was always possible for the supplier of the particular computer processing system **11** to customize the output for the imagined needs of future users, or to customize the output for a particular user, given adequate time and resources. In either case, however, the customization was "hard coded" into the application program, not thereafter readily susceptible to changes by the user. Different users, of course, required different customizations, all at significant costs in time and other resources. It is a significant advantage of the phaser processing system **13** of the present invention that the format and content of the customized planar output **14** is entirely under the control of the user.

It was also possible in the prior art for the supplier of the particular computer processing system **11** to include in the application software a more or less general purpose report generator. Such report generators had the capability of allowing the user to select the data and the format for the planar output **12**, thus supplying one of the needs met by the present invention. Unfortunately, however, such report generators are at least as complex to implement as the application itself, and hence expensive to provide. Furthermore, the degree of variation permitted in formatting or data content was limited, dependent in part on the software supplier's view of the needs of the ultimate user. For example, many report generator programs simply permitted the user to display or not display the contents of specific fields in the data records, with no more sophisticated selection criteria and no further processing possible. More importantly, such report generators were specific to the applications software in which they resided. Hence, when a new application processing system **11** is used, an entirely new report generator must be provided or devised. In addition to the cost and delay time in providing such new report generators, it is typical for the new report software to require retraining of the entire user community, since the methodology and the conventions for the new report generator are normally different from other prior report generators. It is another significant advantage of the present invention that the phaser processing system **13** can be applied to the paginated, planar output from any computer processing system **11**, provided only that the output is divided into pages or images on a terminal screen, that is, as long as the output is a succession of two-dimensional data arrays which can be divided into rows and columns, into lines and characters, or into any other two-dimensional coordinate identifiers.

Although general purpose report generators are available in the prior art, in order to use these report generators, the data base itself must be reformatted to the specifications of the report generator and the data base manager supplied with the report generator used to access information from the data base. The difficulty with this arrangement is the obverse of the difficulties pointed out above. That is, the data base universe has to be tailored to the particular report generator whereas, above, the report generator universe had to be tailored to the particular data base. Neither arrangement deals efficiently with the actual data base arrangements present in the real world. The major advantage of the present invention is the provision of tailored output from any data base by tailoring the user-readable output of the data base rather than the data base itself. Indeed, it is possible for the system of the present invention to convert data which is not paginated into paginated data, and hence it can be used to convert a stream of data, originally intended for electronic consumption, into a series of pages useful for human readers.

It is to be noted that the purpose of customizing the output of a particular computer processing system **11** may be to transfer the customized data on to another computer processing system rather that to present the data to the user. The phaser system of the present invention is perfectly suitable for this arrangement and, in doing so, can reduce the delay in performing such further processing to virtually zero. It should also be noted that one very important use of decimated computer processing output is in regression testing. Regression testing generally involves the comparison of the outputs from new and old versions of the same program. If they are identical, the new version is considered to be correct. In regression testing, it is undesirable to compare all of the output since the time required would be prohibitive and some portions of the output tend to be date or time dependent and hence not comparable. Regression testing is therefore the art of selecting test cases which are typical, repeatable, and cover all of the major capabilities of the system. The decimation of the output data from the new and old versions of the same program for regression testing comparisons is a major use of the phaser processing system of the present invention.

In FIG. **2** there is shown a typical example of the type of post-processing of paginated output permitted by the phaser processing system **13** of the present invention. In FIG. **2**, there are shown three different views **15**, **16** and **17** of the same paginated portion of the output from a computer processing system such as system **11** of FIG. **1**. Page 15 shows a window **18** containing the data characters "origin" in the lower, central portion of page 15. As suggested by the text between the pages 15–7, the appearance of the characters "o-r-i-g-i-n" in window **15** causes the contents "France" of window **19** in the upper right hand corner of page 16 to be changed to "Italy" in

window **19** of page 17. This type of pattern recognition and conditional pattern changing is only typical of the phaser processing system **13** of the present invention. Virtually any other type of two-dimensional processing is possible.

The general types of analysis actions available in the phaser system are replace, choose, remove and replace everything but. Combinations of these four basic actions provide virtually universal flexibility in decomposing paginated output. Similarly, the general categories of objects upon which these actions can be taken are virtually universal. Thus, the replace, choose, remove and replace everything but actions can be applied to pages, lines, columns, strings, boxes (like windows **19** in FIG. **2**), blocks (lists of strings, not necessarily contiguous), and "clouds" (entire pages treated as one continuous string for SPITBOL ® pattern searches). SPITBOL patterns are described, for example, in SPITBOL-68K Program Reference Manual, by R. B. K. Dewar, Catspaw, Inc., Salida, Colo., 1987. SPITBOL is a dialect of the SNOBOL language, described in The SNOBOL4 Programming Language, R. E. Griswold et al., Prentice-Hall, Englewood Cliffs, N.J., 2nd Ed., 1971. The pages of information thus decomposed by the replace, choose, remove and replace everything but actions can be recomposed however the user wishes by the merge action which recombines the decomposed elements into new pages with new formats.

In operation, the user of the phaser system of the present invention describes the post-processing desired by a sequence of statements involving the actions and objects described above. These statements make up a phaser program and are used by the phaser system as described in connection with FIG. **3**. Turning then to FIG. **3**, there is shown a flowchart of the phaser processing system **13** of FIG. **1**. The process of FIG. **3** starts in start box **20**. In box **21**, most of the variables used in the phaser system of FIG. **3** are initialized. Similarly, in box **22**, most of the patterns used in the phaser system are initialized. The phaser program **24** consists of a number of statements involving actions and objects as described above. In box **23**, the phaser program is compiled and a phaser listing **25** produced for assistance in trouble shooting. The phaser program compiled in box **23** is executed in box **26** to translate the standard planes of data **27** into the customized planes of data **28**, all in accordance with the user's wishes as expressed in phaser program **24**.

The phaser program **24** of FIG. **3** is typically divided up into a number of working sets, each working set defining the processing steps to be carried out on one set of input data to produce one particular data output. A phaser program can include any number of such working sets, each working set working on a different data input set, or providing different processing steps for the same input data. The basic phaser statement types are defined below, where <argument> is a variable name, where capital letters identify the predefined actions, where "objects" are as defined above, and where square brackets around an argument indicate that the argument is optional:

1. define <working set name> using <using group>. This statement is used to mark the beginning of a working set. The working set name is the unique name of this working set. The using group in the using clause is a list of the inputs to this working set, including filenames (in parentheses) or set names of other working sets.
2. end <working set name>. This statement is used to mark the end a working set.
3. choose <object1> [where <object2> <contain phrase> <pattern>]. The current text set will be modified to include only the <object1> portion of the input text if the <object2> portion of the input text meets the specifications of the where clause.
4. remove <object1> [where <object2> <contain phrase> <pattern>]. The current text set will be modified so that it will not include the <object1> portion of the input text if the <object2> portion of the input text meets the specifications of the where clause.
5. replace <object1> with <string> [where <object2> <contain phrase> <pattern>]. The current text set will have the <object1> portion of the input text replaced with repetitions of the with string only if, and only if, the <object2> portion of the input text meets the specifications of the where clause.
6. replace everything but <object1> with <string> [where <object2> <contain phrase> <pattern>]. The current text set will have everything in the input text set but the <object1> portion of the input text replaced with the with string if, and only if, the <object2> portion of the input text meets the specifications of the where clause.
7. merge <mergetype> <mergeobject1> <mergeobject2>. Merge successive pairs of plane objects (pages from files or from working sets) side-by-side, one-after-another or line-by-line (mergetypes). Plane objects may be the current working set plane contents, a plane read from a file, or a remembered plane.
8. pad on the <direction> with <number> <string>. Add <number> copies of <string> on the <direction> side of the current working set plane. The direction is right or left.
9. remember as <name>. Save a copy of the contents of the current working set plane for later retrieval under the key <name>.
10. translate from <string1> to <string2>. Replace single character in <string1> with single characters in <string2>. This could be done with replace, but not as efficiently.
11. write <string> to <filename>. Store a literal string in a file.
12. print to <filename>. Print the contents of the current working set to <filename>.

The "objects" of the above action statements can be any one or two-dimensional regions on an input plane, not necessarily contiguous. Such regions can be defined in terms of page numbers for groups of pages, line numbers, ranges or patterns for groups of lines, column numbers, ranges or patterns for groups of columns, coordinates or patterns for strings, and coordinates or patterns for a rectangular box. Other definitions of regions include "clouds" defined by patterns and "blocks" defined by lists of line segments. These relationships between the actions and the regions will be discussed in connection with a discussion of the syntax diagrams of FIGS. **4A** and **4B**.

Before turning to FIG. **4A**, it should be noted that a phaser statement is a section of source code beginning with one of the action words identified above (define, end, replace, choose, remove, etc.) and ending with a semicolon. A phaser working set is a plurality of phaser statements introduced by a define statement and terminated by an end statement. A phaser program is one or more working sets. Note that the input to a working set

can be the output of one or more other working sets as well as the contents of one or more data files. By processing working sets in a user-defined order, the phaser system is able to perform logical unions and intersections of the working set parameters. That is, sequential working sets are ANDed and parallel working sets are ORed.

With the above as a background, the syntax diagram of FIGS. **4A** and **4B** can now be considered. The syntax diagrams of FIGS. **4A–4B** are so-called "railroad" diagrams. In these diagrams, movement takes place through the diagram from left to right and various branches can be entered as if railroad switches were operated to permit access to that branch. The direction of the branch curves suggests the unidirectional nature of the branching.

In FIG. **4A**, the action words of the working set statements are found at reference numeral **40** while the objects affected by these actions and their respective position specifications are found at reference numeral **41**. Note that all possible combinations of actions, objects and position specifications are accounted for in the syntax diagram. At reference numeral **42**, the replacement value is available for the replace statements. In FIG. **4B**, the conditional where clauses are taken care of at reference numeral **43** with the objects and position specification named in the WHERE clause appearing at reference numeral **44**. Finally, at reference numeral **45**, the text comparison patterns are accounted for. Using the syntax diagram of FIGS. **4A** and **4B**, the generation of a compiler for phaser statements is straightforward and obvious to persons skilled in the compiler art.

It will be noted that the phaser system allows two-dimensional objects in the planar output of a computer processing system to be described in a wide variety of ways: page numbers, column and line numbers, patterns in strings, boxes, blocks and clouds, and so forth. In order to process the contents of such objects, it is essential to provide a common representation of the information location in the planar output, regardless of how such information was described by the user. The common representation used in the phaser system is called the "segment list." A segment list is a list composed of all of the line segments making up the data identification of an object and its descriptors. Such segment lists are composed of items which take the form:

(a, b-c)

where a is the line number in which the line segment is located, b is the starting column number of the line segment and c is the ending column number of the line segment. The asterisk ("*") is used as a wild card value in segment list items to simplify representations. Thus, "(*, b-c)" represents the segments between columns b and c for all lines, "(a, b-*)" represents the segment on line a from column b to the end of the line, and "(*, 1—*)" represents an entire page. Data in the planar output of a computer processing system is located in terms of all of the locators described above, including pattern matching. Once located, however, all information specifications internal to the phaser system are kept in the form of segment lists and passed between processes in this form. It is therefore unnecessary to provide special processing routines for all of the different forms of data identifiers available in the system (FIGS. **4A–4B**). All internal processing is done on segment lists, and all data representations are converted to and from the segment list representation whenever any processing is necessary. Some regions translate directly into segment list notation (lines and columns), but some can be translated to segment list notation only after the data is identified, e.g., by pattern matching.

Since segment list items can arise from a variety of phaser statements, it is possible for various items to include portions of overlapping segments. While the system would operate properly with such overlapping items, the processing would be less than optimum since certain segments would be treated more than once. In order to eliminate such multiple processing, each segment list, just prior to processing, is sorted, duplicate segments eliminated and overlapping segments combined into a single segment. A simple comparison of line numbers and column numbers readily permits such segment list optimization.

The phaser system represented in block form in FIG. **3** can also be represented by the following pseudo-code in Table I:

TABLE I

```
main ( )
        define variables
        define patterns
        parsegen ( )
                while input
                getstat ( )
                        read statement
                        if defset
                                then
                                        start workingset code
                                end then
                        else if endset
                                then
                                        terminate workingset code
                                end then
                        else if intersperse merge
                                then
                                        buildintersperse
                                end then
                        else if action statement
                                then
                                        buildcode
                                end then
                        else if merge statement
                                then
                                        buildmerge
                                end then
                        end else
                end getstat
        end parsegen
        process ( )
                if no endset
                        then
                                add endset
                        end then
                end if
                fileroutine ( )
                        while no NULL
                                readpage ( )
                                rout (workingsets)
                        end while
                end fileroutine
        end process
end main
```

The define routines create all of the fixed variables and fixed patterns to be used in the balance of the program. The parsegen routine is the compiler, using the syntax of FIGS. **4A** and **4B**, to create executable code from the phaser statements. For example, getstat gets the next phaser statement (terminated by a semicolon). The defset routine sets up the data structures specified as input and the working set-data structure control structures necessary to identify and eventually execute

each working set against the appropriate data structures. The buildcode, buildmerge and buildintersperse routines create the actual executable code for the action statements, merge statements and intersperse statements, respectively. The endset routine terminates the working set and triggers the actual compilation of the working set code.

In TABLE I, the process routine actually executes the compiled phaser executable code. First, the endset routine is called in case the final END statement is missing. The fileroutine routine loops through the input files identified in the define statements (up to an end-of-file, EOF), passing the input planes of data, one by one, on to the rout routine. The rout routine finds each working set which specifies this file in its using clause, and executes the compiled working set against that plane. The rout routine also finds the working sets which must follow other working sets (in accordance with the using clause of the define statements) and insures proper ordering of the execution of the working sets. Execution of the working set code continues until the input has been exhausted and all planes have been processed. SPITBOL code descriptions of each of these routines can be found in the Appendix to this application.

An illustrative example of a phaser user program will be given to aid in the understanding of the present invention. It is to be understood that this example is illustrative only, and should not be treated as limiting in any sense. Indeed, the illustrative example was chosen to be relatively simple to aid in the understanding of the invention. The following phaser program is illustrative:

TABLE II

```
define a using (file1);
        remove pages where they contain 'xyz';
define b using a;
        remove pages where they contain 'abc';
end b;
define c using a;
        remove pages where they contain '111';
end c;
define d using b, c;
        replace strings with 'xyz' where they contain 'kag';
        print to (outfile);
end d;
```

The result of compiling and executing the phaser program of TABLE II is shown graphically in FIG. **5**. Each box in FIG. **5** represents a working set. Thus the contents of "file**1**" are operated on (by way of line **50**) by working set **51**, identified as working set "a." The output of working set **51** is routed to both working set **52** ("*b*") and working set **53** ("*c*"). The outputs of working sets **52** and **53** are both routed to the input to working set **54** ("*d*"). Thus, the output of working set **54** on leads **55** is the ORed combination of working sets **52** and **53**, subject to (ANDed with) the post-ORing operations of working set d. It is clear that any other Boolean combination of operations can be performed on the input data simply by appropriately specifying the working set inputs. In this sense, phaser applies a very large grain data flow (one plane at a time) to the editing of collections of plane-oriented output. Moreover, the phaser commands exploit the two-dimensional aspects of the planar output to transform two-dimensional arrays or patterns of alphanumeric data by filtering each page-sized plane through a virtually arbitrarily prescribed network of plane-oriented filters.

It should be clear to those skilled in the art that further embodiments of the present invention may be made by those skilled in the art without departing from the teachings of the present invention.

APPENDIX

```
-LIST
*
*     COPYRIGHT (C) 1988 BELL COMMUNICATIONS RESEARCH
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*
*
-TITLE      PHASER
*
*
-STITL      ALLSEGSFROMPT

      DEFINE('ALLSEGSFROMPT(SHAPE,PAGE)TSHAP,P1,P2,CNT,C3,'
+     'C1,CNT2,C2,TEMP1,HEAD,CURRENT,GREATER,TONEWLIST,LESS,'
+     'OLDHEAD2')
+           :(ENDALLSEGSFROMPT)
```

```
ALLSEGSFROMPT
    MATCH(EPATPAT,SHAPE)  :F(BADSHAPEINALLSEGS)
    P1 = EVAL(P1)
    P2 = EVAL(P2)
    &ANCHOR = 0
    HEAD = SEGMENT(0,0,0)
    CURRENT = HEAD
    C3 = 0
    CNT = 1
ALLLSFP  (?(PAGE< CNT> ) DIFFER(PAGE< CNT> ,BOL)) :S(HIRETURN)
    PAGE< CNT>  @C1 P1 *GT(C1,C3) :S(ALLFOUNDBEGIN)

    CNT = CNT + 1 :(ALLLSFP)
ALLFOUNDBEGIN
    CNT2 = CNT
    PAGE< CNT> P2 @C2 *GT(C2,C1) :S(ALLFOUNDEND)
    CNT2 = CNT2 + 1
ALLLSFP2
    (?(PAGE< CNT2> ) DIFFER(PAGE< CNT2> ,BOL)) :S(HIRETURN)
    PAGE< CNT2> P2 @C2 :S(ALLFOUNDEND)
    CNT2 = CNT2 + 1 :(ALLLSFP2)
ALLFOUNDEND
    IDENT(TSHAP,'LINES')   :F(HISTR)
    TEMP1 = CNT
HI1  LE(TEMP1,CNT2)  :F(NEXTMATCHPREP)
    NEXT(CURRENT) = SEGMENT(TEMP1,1,'*')
    CURRENT = NEXT(CURRENT)
    TEMP1 = TEMP1 + 1 :(HI1)
HISTR  IDENT(TSHAP,'STRINGS')  :F(HIBOX)
    NEXT(CURRENT) = SEGMENT(CNT,C1 + 1,C2)
    CURRENT = NEXT(CURRENT) :(NEXTMATCHPREP)
HIBOX  IDENT(TSHAP,'BOXES') :F(HICOL)
    TEMP1 = CNT
HI2   LE(TEMP1,CNT2)  :F(NEXTMATCHPREP)
    NEXT(CURRENT) = SEGMENT(TEMP1,C1 + 1,C2)
    CURRENT = NEXT(CURRENT)
    TEMP1 = TEMP1 + 1 :(HI2)
HICOL  IDENT(TSHAP,'COLUMNS') :F(BADSHAPEINALLSEGS)
    NEXT(CURRENT) = SEGMENT('*',C1 + 1,C2)
    CURRENT = NEXT(CURRENT)
NEXTMATCHPREP
    CNT = CNT2
    C3 = 0
    PAGE< CNT>  @C1 P1 *GT(C1,C2) :S(ALLFOUNDBEGIN)
    CNT = CNT + 1 :(ALLLSFP)
HIRETURN
    ALLSEGSFROMPT = DIFFER(TSHAP,'COLUMNS') NEXT(HEAD)
+     :S(RETURN)
    HEAD = NEXT(HEAD)
ALLSORDIT
    TONEWLIST = SEGMENT(0,0,0,HEAD)
    HEAD = DIFFER(NEXT(HEAD),NULL) NEXT(HEAD)
+       :F(ALLSTRIPHEAD)
    NEXT(NEXT(TONEWLIST)) = NULL
ALLLOOOP1
    LESS = TONEWLIST
    GREATER = NEXT(TONEWLIST)
```

```
ALLLOOOP
    IDENT(GREATER,NULL) :S(ALLINSERT)
    LT(START(HEAD),START(GREATER)) :S(ALLINSERT)
    LESS = GREATER
    GREATER = NEXT(GREATER) :(ALLLOOOP)
ALLINSERT
    OLDHEAD2 = HEAD
    HEAD = NEXT(HEAD)
    DIFFER(GREATER,NULL) EQ(START(OLDHEAD2),START(GREATER))
+   START(GREATER)),IDENT(FINISH(OLDHEAD2),FINISH(GREATER))
+   :S(ALLSEND)
    NEXT(LESS) = OLDHEAD2
    NEXT(OLDHEAD2) = GREATER
ALLSEND IDENT(HEAD,NULL) :F(ALLLOOOP1)
ALLSTRIPHEAD
    TONEWLIST = NEXT(TONEWLIST)
    ALLSEGSFROMPT = TONEWLIST      :(RETURN)
ENDALLSEGSFROMPT

-STITL  BUILDCODE

    DEFINE('BUILDCODE(WS,VRB,SH1,EVB,SH2,WTH,CNT,PTT)'
+   'TVRB,BASE,RNGFROM,RNGTO,SAVE1,SAVE2,CLOUDPAT2
+   CLOUDPAT') :(ENDBUILDCODE)
BUILDCODE
*   IF SHAPE2 = 'THEY' THEN SHAPE2 = SHAPE1
    SH2 = IDENT(SH2,'THEY') SH1
*   IF VRB = 'REPLACE EVERYTHING BUT' THEN VRB = REB
    VRB = MATCH(BTN 'REPLACE' BT 'EVERYTHING' BT 'BUT',VRB)
+   'REB'
*   IF VRB IS 'TRANSFORM EVERYTHING BUT' THEN VRB = 'TEB'
    VRB = MATCH(BTN 'TRANSFORM' BT 'EVERYTHING' BT 'BUT'
+   VRB) 'TEB'
    OUTLISTING = DIFFER(VRB,'TRANSFORM') DIFFER(VRB,'TEB')
+   OUTLISTING_ERROR "TRANSFORM NOT FULLY SUPPORTED YET"
*   IF SHAPE1 IS A SINGLE PATTERN BUT NOT A CLOUD
    BASE = MATCH(PATPAT,SH1)
+       'MUSHBYSEGS(" VRB ",' WTH
+       ',PAGE,OPTM(SEGSFROMPT(" SH1 ",PAGE)))' :S(TWO)

*   IF SHAPE1 IS AN EVERY PATTERN BUT NOT A CLOUD
    BASE = MATCH(EPATPAT,SH1)
+       'MUSHBYSEGS(" VRB ",' WTH
+       ',PAGE,OPTM(ALLSEGSFROMPT(" SH1 ",PAGE)))'
+       :S(TWO)

*   IF SHAPE1 IS A CLOUD
    BASE = MATCH(CPATPAT,SH1)
+       'MUSHCLOUD(" VRB ",' WTH ',PAGE,'
+       CLOUDPAT ')'                :S(TWO)

*   IF SHAPE1 IS A PAGE RANGE
    BASE = MATCH(PAGERNGPAT,SH1)
+       'MUSHRANGE(" VRB ",' WTH ',PAGE,'
+       RNGFROM ',' RNGTO ')'  :S(RETBASE)
```

```
*    IF SHAPE1 IS DEFERRED, AND SHAPE2 = SHAPE1 OR SHAPE1
*    DEALS WITH A WHOLE MESSAGE/PAGE/SCREEN
     BASE = MATCH(DEFERPAT RPOS(0),SH1)  (IDENT(SH1,SH2)
+          MATCH(DEFERPAGEPAT,SH1))
+          'MUSHWHOLEPAGE(" VRB ",' WTH ',PAGE)' :S(TWO)
*    IF SHAPE1 IS DEFERRED, SHAPE2= SHAPE1,
*    VRB = REB AND VRB = TEB AND CONTAINS
     BASE = MATCH(DEFERPAT RPOS(0),SH1) IDENT(SH1,SH2)
+    IDENT(CNT,'CONTAIN') DIFFER(VRB,'REB') DIFFER(VRB,'TEB')
+    'MUSHBYSEGS(" VRB ",' WTH
+         ',PAGE,OPTM(SHAPESFROMSEGS(" SH1 ",'
+         'FINDOCCURSEGS('
+         PTT ',PAGE))))'      :S(RETBASE)
*    IF SHAPE1 IS DEFERRED, SHAPE2= SHAPE1
*    VRB = REB AND CONTAINS
     BASE = MATCH(DEFERPAT RPOS(0),SH1) IDENT(SH1,SH2)
+    IDENT(CNT,'CONTAIN') IDENT(VRB,'REB')
+         'MUSHBYSEGS("REPLACE",' WTH
+         ',PAGE,NOTSEGS(OPTM(SHAPESFROMSEGS(" SH1 ",'
+         'FINDOCCURSEGS('
+         PTT ',PAGE)))))'          :S(RETBASE)
*    IF SHAPE1 IS DEFERRED, SHAPE2= SHAPE1
*    VRB = TEB AND CONTAINS
     BASE = MATCH(DEFERPAT RPOS(0),SH1) IDENT(SH1,SH2)
+    IDENT(CNT,'CONTAIN') IDENT(VRB,'TEB')
+         'MUSHBYSEGS("TRANSLATE",' WTH
+         ',PAGE,NOTSEGS(OPTM(SHAPESFROMSEGS(" SH1 ",'
+         'FINDOCCURSEGS('
+         PTT ',PAGE)))))'          :S(RETBASE)
*    IF SHAPE1 IS DEFERRED, SHAPE2= SHAPE1,
*    CONT IS NOT CONTAINS AND VERB IS NOT REPLACE
     BASE = MATCH(DEFERPAT RPOS(0),SH1) IDENT(SH1,SH2)
+    DIFFER(CNT,'CONTAIN') DIFFER(VRB,'REPLACE')
+         'MUSHBYSEGS(" OPPVRB< VRB> ",' WTH
+         ',PAGE,OPTM(SHAPESFROMSEGS(" SH1
+         ",FINDOCCURSEGS('
+         PTT ',PAGE))))'      :S(RETBASE)

*    IF SHAPE1 IS DEFERRED, SHAPE2= SHAPE1,
*    CONT IS NOT CONTAINS AND VERB IS REPLACE
     BASE = MATCH(DEFERPAT RPOS(0),SH1) IDENT(SH1,SH2)
+    DIFFER(CNT,'CONTAIN') IDENT(VRB,'REPLACE')
+         'MUSHBYSEGS("REPLACE",' WTH
+         ',PAGE,NOTSEGS('
+         'OPTM(SHAPESFROMSEGS(" SH1
+         ",FINDOCCURSEGS(' PTT ',PAGE)))))'   :S(RETBASE)
*    IF SHAPE1 IS SEGMENTED
     SEGTAB< 'SEG' LABCNT > = DIFFER(VRB,'REB') DIFFER(VRB
+    'TEB'), OPTM(FINDSEGLIST(SH1)) :S(ONEO)
     SEGTAB< 'SEG' LABCNT > =
+         NOTSEGS(OPTM(FINDSEGLIST(SH1)))
ONEO  TVRB = VRB
     TVRB = IDENT(VRB,'REB') 'REPLACE'
     TVRB = IDENT(VRB,'TEB') 'TRANSFORM'
```

```
        BASE =
    +       'MUSHBYSEGS('' TVRB ''),' WTH
    +       ',PAGE,SEGTAB< ''SEG' LABCNT ''> )'
        LABCNT = LABCNT + 1
    *                   :(TWO)
    TWO
    *   IF SHAPE2 IS NULL
        IDENT(SH2,NULL)     :S(RETBASE)

    *   IF SHAPE2 IS A SINGLE PATTERN BUT NOT A CLOUD
        BASE = DIFFER(EVB,NULL)
    +       MATCH(PATPAT,SH2)
    +       'MATCHSEGS(' PTT ',NOTSEGS(OPTM(SEGSFROMPT(''
    +       SH2 ''',PAGE))),PAGE)' NC BASE      :S(THREE)

        BASE = MATCH(PATPAT,SH2)
    +       'MATCHSEGS(' PTT ',OPTM(SEGSFROMPT(''
    +       SH2 ''',PAGE)),PAGE)' NC BASE       :S(THREE)

    *   IF SHAPE2 IS AN EVERY PATTERN BUT NOT A CLOUD
        BASE = DIFFER(EVB,NULL)
    +   MATCH(EPATPAT,SH2)
    +       'MATCHSEGS(' PTT ',NOTSEGS(OPTM(ALLSEGSFROMPT(''
    +       SH2 ''',PAGE))),PAGE)' NC BASE      :S(THREE)

        BASE = MATCH(EPATPAT,SH2)
    +       'MATCHSEGS(' PTT ',OPTM(ALLSEGSFROMPT(''
    +       SH2 ''',PAGE)),PAGE)' NC BASE       :S(THREE)

    *   IF SHAPE2 IS A CLOUD
        BASE = DIFFER(EVB,NULL)
    +   MATCH(CPATPAT,SH2)
    +       'MATCH(' PTT ',GRABNOTCLOUD(PAGE,'
    +       CLOUDPAT ')' NC BASE        :S(THREE)

        BASE = MATCH(CPATPAT,SH2)
    +       'MATCH(' PTT ',GRABCLOUD(PAGE,'
    +       CLOUDPAT ')' NC BASE        :S(THREE)

    *   IF SHAPE2 IS DEFERRED
        BASE = MATCH(DEFERPAT RPOS(0),SH2)
    +       'MATCHWHOLEPAGE(' PTT ',PAGE)' NC BASE :S(THREE)

    *   IF SHAPE2 IS SEGMENTED
            SEGTAB< 'SEG' LABCNT > =
    +       DIFFER(EVB,NULL)
    +       NOTSEGS(OPTM(FINDSEGLIST(SH2))) :S(TWOAS)
            SEGTAB< 'SEG' LABCNT > = OPTM(FINDSEGLIST(SH2))
    TWOAS       BASE = 'MATCHSEGS(' PTT ',SEGTAB< ''SEG'
    +       LABCNT ''> ,PAGE)' NC BASE
        LABCNT = LABCNT + 1
    *                               :S(THREE)
    THREE
        BASE = IDENT(CNT,'CONTAIN') REPLACE(BASE,NC,' ')
    +                   :S(RETBASE)
```

```
      BASE BREAK(NC) . SAVE1 NC REM . SAVE2
      BASE = ' (' SAVE1 ') ' SAVE2              :S(RETBASE)
RETBASE
*     OUTPUT = ' BASE=' BASE
      NONCOMP< WS> = IDENT(OTHERWISEOPT,'NONSTANDARD')
+      NONCOMP< WS>
+     ' PAGE = NOTNULLPG(PAGE) ' BASE ';' :S(RETURN)
      NONCOMP< WS> = DIFFER(VRB,'CHOOSE') DIFFER(VRB,'REB')
+        DIFFER(VRB,'TEB') NONCOMP< WS>
+        ' PAGE = NOTNULLPG(PAGE) ' BASE ';' :S(RETURN)
      NONCOMP< WS> = IDENT(VRB,'CHOOSE') NONCOMP< WS>
+        ' PAGE = NOTNULLPG(PAGE) ' BASE ' :S(GENLAB' LABCNT
+        ') ; PAGE< 1> = BOL ;GENLAB' LABCNT ' ;'      :S(YRETURN)
      NONCOMP< WS> = IDENT(VRB,'REB')
+          NONCOMP< WS> ' PAGE = NOTNULLPG(PAGE) '
+          BASE ' :S(GENLAB' LABCNT ') ; PAGE = NOTNULLPG(PAGE) '
+          'MUSHWHOLEPAGE("REPLACE",' WTH ',PAGE) ;GENLAB'
+          LABCNT ';'                    :S(YRETURN)
      NONCOMP< WS> = NONCOMP< WS> ' PAGE = NOTNULLPG(PAGE) '
+          BASE ' :S(GENLAB' LABCNT ') ; PAGE = NOTNULLPG(PAGE) '
+          'MUSHWHOLEPAGE("TRANSFORM",' WTH ',PAGE) ;GENLAB'
+          LABCNT ';'
YRETURN LABCNT = LABCNT + 1    :(RETURN)
ENDBUILDCODE

-STITL      BUILDMERGE - BUILDMERGE.S

      DEFINE('BUILDMERGE(WS,TYPE,OBJ1,OBJ2,MEMP)NEWOBJ1
+     NEWOBJ2,' 'EMPTYCLAUSE,NEWNAME1,NEWNAME2')
+       :(END_BUILDMERGE)
BUILDMERGE
+     EMPTYCLAUSE = DIFFER(MEMP) ' NOTNULLPG(PAGE) '
      NEWOBJ1 = IDENT(OBJ1,'*') "COPY(PAGE)"
+       :S(BLDMRG2_BUILDMERGE)
      OBJ1 "(" BTN NAME . NEWNAME1 BTN ")"
+       :F(BLDMRG1_BUILDMERGE)
      NEWOBJ1 = "READORNULL(" NEWNAME1 ")"
      IDENT(NONUSINGINS< NEWNAME1> ,NULL)
+       :F(BLDMRG2_BUILDMERGE)
      NONUSINGINS< NEWNAME1> = "MERGE"
      PAGETAB< NEWNAME1> = COPY(NULLARRAY)
      OPENIN(NEWNAME1)              :(BLDMRG2_BUILDMERGE)

BLDMRG1_BUILDMERGE
+     OBJ1 NAME . NEWNAME1
      NEWOBJ1 = 'COPY(REMEMBERY< '" NEWNAME1 '"> )'
BLDMRG2_BUILDMERGE
+     NEWOBJ2 = IDENT(OBJ2,'*') "COPY(PAGE)"
+       :S(BLDMRG4_BUILDMERGE)
      OBJ2 "(" BTN NAME . NEWNAME2 BTN ")"
+       :F(BLDMRG3_BUILDMERGE)
      NEWOBJ2 = "READORNULL(" NEWNAME2 ")"
      IDENT(NONUSINGINS< NEWNAME2> ,NULL)
+       :F(BLDMRG4_BUILDMERGE)
      NONUSINGINS< NEWNAME2> = "MERGE"
      PAGETAB< NEWNAME2> = COPY(NULLARRAY)
      OPENIN(NEWNAME2)              :(BLDMRG4_BUILDMERGE)
```

```
BLDMRG3_BUILDMERGE
+     OBJ2 NAME . NEWNAME2
      NEWOBJ2 = 'COPY(REMEMBERY< '" NEWNAME2 '"> )'
BLDMRG4_BUILDMERGE
+     NONCOMP< WS> = MATCH(LMERGE,TYPE)
+          NONCOMP< WS> ' PAGE = ' EMPTYCLAUSE
+            ' MRGLINEBYLINE(' NEWOBJ1 ',' NEWOBJ2 ');'
+                                   :S(RETURN)
      NONCOMP< WS> = MATCH(SMERGE,TYPE)
+          NONCOMP< WS> ' PAGE = ' EMPTYCLAUSE
+            ' MRGSIDEBYSIDE(' NEWOBJ1 ',' NEWOBJ2 ');'
+                                   :S(RETURN)
      NONCOMP< WS> = MATCH(OMERGE,TYPE)
+          NONCOMP< WS> ' PAGE = ' EMPTYCLAUSE
+            ' MRGONEAFTER(' NEWOBJ1 ',' NEWOBJ2 ');'
+                                   :S(RETURN)
      OUTLISTING = OUTLISTING_ERROR 'BAD TYPE IN BUILDMRG'
+          :(END)
END_BUILDMERGE

-STITL    BUILDINTERSPERSE

      DEFINE('BUILDINTERSPERSE(INDD,OUTDD,KEY,KEY2,TYPE,INAME,'
+     'INAME,WS,REVERSED)')
+     :(ENDBUILDINTERSPERSE)
BUILDINTERSPERSE
*     FOR HOLDPAGE
      NONCOMP< WS> = NONCOMP< WS> 'GENLAB' LABCNT ' INTERSPERSE('"
+     INTERSPERSE('",INAME '",PAGE,GETINTERPAGE('" INDD '"),
+       '" OUTDD '"," KEY
+     '"," KEY2 '"," TYPE '"," REVERSED '") :F(GENLAB' LABCNT
+     ');'
      LABCNT = LABCNT + 1 :(RETURN)
ENDBUILDINTERSPERSE

-STITL       COMPAIRE

      DEFINE('COMPAIRE(NEW,OLD,DIFFDD,CNAME)CNT,HEAD,CURRENT,'
+     'SIGGY,ARY')
+     :(ENDCOMPAIRE)
COMPAIRE
      LT(COMPAIRETAB< CNAME> ,MAXCOMPARES) :F(RETURN)
* SET HEAD TO POINT TO A NULL ELEMENT
      HEAD = DIFFLINES(0,NULL)
      CNT = 0
* SET CURRENT TO HEAD
      CURRENT = HEAD
*     ASSUMES ARRAYS ARE THE SAME SIZE
YUCKLOOP
* ARE WE OUT OF LINES , IE SO PRINT
       (NEW< CNT + 1> )  (OLD< CNT + 1> ) :S(YUCKPRINT)
* IF WE ARE OUT OF EITHER PRINT
       (NEW< CNT + 1> ) :S(YOLDONLY)
       (OLD< CNT + 1> ) :S(YNEWONLY)
      CNT = CNT + 1
* ARE WE AT BOTH ENDS, IF SO PRINT
```

```
    IDENT(NEW< CNT> ,BOL) IDENT(OLD< CNT> ,BOL) :S(YUCKPRINT)
* ARE WE AT EITHER END, IF SO PRINT
    IDENT(NEW< CNT> ,BOL)    :S(YOLDONLY)
    IDENT(OLD< CNT> ,BOL)    :S(YNEWONLY)
* COMPARE A LINE, IF THE SAME GO TO NEXT LINE LOOP
    IDENT(TRIMCOMPARE,'YES')
+    IDENT(TRIM(NEW< CNT> ),TRIM(OLD< CNT> ))   :S(YUCKLOOP)
    DIFFER(TRIMCOMPARE,'YES')
+    IDENT(NEW< CNT> ,OLD< CNT> )      :S(YUCKLOOP)
* LINES ARE DIFFERENT, ADD THE LINE NO. TO THE LIST
* SET THE CURRENT TO THE LATEST ELEMENT
    NEXTDIFF(CURRENT) = DIFFLINES(CNT,NULL)
    CURRENT = NEXTDIFF(CURRENT) :(YUCKLOOP)
YOLDONLY
* ONLY THE OLD IS LEFT, SET ALL ITS LINES TO DIFFERENT
    NEXTDIFF(CURRENT) = DIFFLINES(CNT,NULL)
    CURRENT = NEXTDIFF(CURRENT)
    CNT = ?(OLD< CNT + 1> ) CNT + 1  :F(YUCKPRINT)
    IDENT(OLD< CNT> ,BOL) :S(YUCKPRINT)F(YOLDONLY)
YNEWONLY
* ONLY THE NEW IS LEFT, SAME NOTE AS ABOVE
    NEXTDIFF(CURRENT) = DIFFLINES(CNT,NULL)
    CURRENT = NEXTDIFF(CURRENT)
    CNT = ?(NEW< CNT + 1> ) CNT + 1  :F(YUCKPRINT)
    IDENT(NEW< CNT> ,BOL) :S(YUCKPRINT)F(YOLDONLY)
YUCKPRINT
* TIME TO PRINT
* IF WE ONLY HAVE ONE ELEMENT, RETURN
    IDENT(NEXTDIFF(HEAD),NULL) :S(RETURN)
* BUMP FAILING PAGE COUNT
    COMPAIRETAB< CNAME> = COMPAIRETAB< CNAME> + 1
* IF NO IBMCC, PRINT OLD AND NEW PAGES
* BEGINNING OF CODE TO BE DELETED
*    $DIFFDD = 'BEFORE OLD PAGE'
*    PRINTPAGE(OLD,DIFFDD)
*    $DIFFDD = 'AFTER OLD PAGE AND BEFORE NEW PAGE'
*        PRINTPAGE(NEW,DIFFDD)
*    $DIFFDD = 'AFTER NEW PAGE'   :S(RETURN)
* END OF CODE TO BE DELETED
    DIFFER(IBMCC,1) PRINTPAGE(OLD,DIFFDD,"> ",FORMFEED "> ")
+        PRINTPAGE(NEW,DIFFDD,"< ",FORMFEED "< ")   :S(RETURN)
* IF IBMCC, PRINT OLD AND NEW WITH UNDERLINING
    ARY = OLD
YUCK0  CURRENT = NEXTDIFF(HEAD)
    CNT = 0
YUCK1  CNT = ?(ARY< CNT + 1> ) CNT + 1 :F(YUCK2)
    IDENT(ARY< CNT> ,BOL)    :S(YUCK2)
    $DIFFDD = EQ(CNT,1) '1' ARY< CNT>
    $DIFFDD =  EQ(CNT,1) ' ' ARY< CNT>
    EQ(VALUE(CURRENT),CNT) :F(YUCK1)
    CURRENT = DIFFER(NEXTDIFF(CURRENT),NULL)
+      NEXTDIFF(CURRENT)
    $DIFFDD = UNDERLINE :(YUCK1)
YUCK2  DIFFER(SIGGY,NULL)    :S(RETURN)
    SIGGY = 1
    ARY = NEW :(YUCK0)
```

```
ENDCOMPAIRE

-STITL      DEBUG

     DEFINE('DEBUG(S)','START_DEBUG') :(END_DEBUG)
START_DEBUG
     IDENT(S,'ON')          :S(ON_DEBUG)
     IDENT(S)               :S(ON_DEBUG)
     &TRACE = 0
     &FTRACE = 0
     OUTLISTING = OUTLISTING_MSG "DEBUGGING OFF"
                  :(RETURN)
ON_DEBUG
     OUTLISTING = OUTLISTING_MSG "DEBUGGING ON"
     &TRACE = 10000
     &FTRACE = 10000
     TRACE(.IOASOCVAR1,'V')
     TRACE(.IOASOCVAR1,'A')
     TRACE(.IOASOCVAR2,'V')
     TRACE(.IOASOCVAR2,'A')
     TRACE(.OPENINPUTFILES,'V')    :(RETURN)
END_DEBUG

-STITL      DEFSTMT

     DEFINE('DEFSET(WSET,USINGS)USE,USE2')
+       :(ENDDEFSET_DEFSET)
DEFSET
+    USINGS BTN "(" BASEEXP1 . USE ")" ENDOFDEF =
+                          :S(INPUTFILE_DEFSET)
     USINGS BTN BASEEXP1 . USE ENDOFDEF =
+      :S(WORKINGSET_DEFSET)
     OUTLISTING = OUTLISTING_ERROR
+      "INVALID USING IN DEFINE STATEMENT: "
+                          :(FRETURN)
INPUTFILE_DEFSET
+    USE BT =
     USE = TRIM(REPLACE(USE,TAB,BLANK))
     INPUTTAB< USE> = IDENT(INPUTTAB< USE> ) USE
WORKINGSET_DEFSET
+    TEMPASSO< USE> = TEMPASSO< USE> ";" WSET
     IDENT(USINGS)          :S(RETURN)F(DEFSET)
ENDDEFSET_DEFSET

-STITL      DENDSTMT

     DEFINE('ENDSET(WSET)')          :(ENDENDSET)
ENDSET OUTLISTING = OUTLISTING_MSG ' '
     COLLECT(1)
     CODETAB< WSET> =
+       CODE( NONCOMP< WSET> ' :(BACK)')
CRR  CURWSET = NULL             :(RETURN)
ENDENDSET

-STITL      ENLARGEPAGE.S

     DEFINE("ENLARGEPAGE(PAGE)PROTO,LOW,HIGH,OLDHIGH
```

```
+       CNT')
+                               :(END_ENLARGEPAGE)
ENLARGEPAGE
+       PROTO = PROTOTYPE(PAGE)
        PROTO = BREAKX(':') . LOW ':' NUMBER . OLDHIGH RPOS(0)
        HIGH = CONVERT(HIGH * 1.5, 'INTEGER')
        LT(HIGH,PAGESIZE + 10)                  :S(GO_ENLARGEPAGE)
        OUTLISTING = OUTLISTING_MSG
+           "PAGE SIZE EXAUSTED - ENLARGING PAGES FROM: "
+           (OLDHIGH - 10) " TO: " (HIGH - 10)
        NULLARRAY = ARRAY(LOW ':' HIGH)
        NULLARRAY< 1> = BOL
*       EOFARRAY = COPY(NULLARRAY)
*       EOFARRAY< 0> = EOF
        PAGESIZE = HIGH - 10
GO_ENLARGEPAGE
+       ENLARGEPAGE = COPY(NULLARRAY)
LOOP_ENLARGEPAGE
+       ENLARGEPAGE< CNT> = PAGE< CNT>
        CNT = LT(CNT,HIGH) DIFFER(ENLARGEPAGE< CNT> ,BOL)
+       CNT + 1                 :S(LOOP_ENLARGEPAGE)F(RETURN)
END_ENLARGEPAGE

-STITL       FILEROUTINE - FILEROUTINE.S

        DEFINE('FILEROUTINE()TUPIN')  :(END_FILEROUTINE)
FILEROUTINE
NEWPAGE_FILEROUTINE
*
*  GET CURRENT FILENAME
*
        TUPIN = INPUTARRAY< I,1>
*
*  GET LIST OF DEPENDENTS FOR CURRENT FILE
*
        LIST2OFDEP = TEMPASSO< TUPIN>
*
*  IF I AM READING NON-ROUNDROBIN, CALL READAPAGE
*  IF I AM READING ROUNDROBIN, CALL READORNULL
*
        IDENT(DEFAULTREAD,'ROUNDROBIN') :S(ROUNDROB1_FILEROUTINE)
*       PAGE = READAPAGE('READ1IIIII',TUPIN)
        PAGE = READAPAGE(TUPIN)
+                               :F(RETURN)S(ROUNDR2_FILEROUTINE)
ROUNDROB1_FILEROUTINE
        PAGE = READORNULL(TUPIN)
* BUMP PAGECNT
ROUNDR2_FILEROUTINE
+       PAGECNT = PAGECNT + 1
*
*  FOR EACH DEPENDENT WORKING SET SEND PAGE THROUGH
*
MOREDEP_FILEROUTINE
+       LIST2OFDEP ';' WORD . DEPENDENT =    :F(ISNEWPAGE_FILEROUTINE)
        IDENT(LOOPCHECKING,'OFF')           :S(CALLST_FILEROUTINE)
        IDENT(DEPENDENT,TUPIN)              :F(CALLST_FILEROUTINE)
```

```
    SIGLOOP()                    :(END)
CALLST_FILEROUTINE
+     CALLSTRING = ';' DEPENDENT ';' TUPIN
      LIST2OFDEP ';' WORD              :F(LASTONF_FILEROUTINE)
      ROUT(COPY(PAGE),DEPENDENT,CALLSTRING)  :(MOREDEP_FILEROUTINE)
LASTONF_FILEROUTINE
+     ROUT(PAGE,DEPENDENT,CALLSTRING)      :(MOREDEP_FILEROUTINE)
*
* IF ROUNDROBIN, RETURN TO GET NEXT FILE; OTHERWISE, GET NEXT PAGE
*
ISNEWPAGE_FILEROUTINE
+     IDENT(DEFAULTREAD,'ROUNDROBIN') :S(RETURN)F(NEWPAGE_FILEROUTINE)
END_FILEROUTINE

-STITL      FINDOCCURSEGS

      DEFINE('FINDOCCURSEGS(PTT,PAGE)CNT,P1,P2,TEMP1,'
+     'HEAD,CURRENT')
+           :(ENDFINDOCCURSEGS)
FINDOCCURSEGS
      &ANCHOR = 0
      CNT = 1
NEXLCN IDENT(PAGE< CNT> ,BOL) :S(RETURN)
      PAGE< CNT> @P1 PTT @P2 :S(NEXKCN)
      CNT = ?(PAGE< CNT + 1> ) CNT + 1 :F(RETURN)S(NEXLCN)
NEXKCN HEAD = SEGMENT(CNT,P1 + 1,P2)
      FINDOCCURSEGS = HEAD
      CURRENT = HEAD
      TEMP1 = P1
NEXICN PAGE< CNT> @P1 PTT @P2 *GT(P1,TEMP1) :F(NEXCN)
      TEMP1 = P1
      FINISH(CURRENT) = LE(P1,FINISH(CURRENT))
+     GT(P2,FINISH(CURRENT)) P2 :S(NEXICN)
      LE(P1,FINISH(CURRENT)) LE(P2,FINISH(CURRENT)) :S(NEXICN)
      NEXT(CURRENT) = SEGMENT(CNT,P1 + 1,P2)
      CURRENT = NEXT(CURRENT) :(NEXICN)
NEXCN  CNT = ?(PAGE< CNT + 1> ) CNT + 1 :F(RETURN)
      IDENT(PAGE< CNT> ,BOL) :S(RETURN)
      PAGE< CNT> @P1 PTT @P2 :F(NEXCN)
      TEMP1 = P1
      NEXT(CURRENT) = SEGMENT(CNT,P1 + 1,P2)
      CURRENT = NEXT(CURRENT)
NEXJN  PAGE< CNT> @P1 PTT @P2 *GT(P1,TEMP1) :F(NEXCN)
      TEMP1 = P1
      FINISH(CURRENT) = LE(P1,FINISH(CURRENT))
+     GT(P2,FINISH(CURRENT)) P2 :S(NEXJN)
      LE(P1,FINISH(CURRENT)) LE(P2,FINISH(CURRENT)) :S(NEXJN)
      NEXT(CURRENT) = SEGMENT(CNT,P1 + 1,P2)
      CURRENT = NEXT(CURRENT) :(NEXJN)
ENDFINDOCCURSEGS

-STITL      FINDSEGLIST

      DEFINE('FINDSEGLIST(SHAPE)HEAD,CURRENT,'
+     'LEMON1,LEMON2,LEMON3,LEMON4') :(ENDFINDSEGLIST)
FINDSEGLIST
```

```
        SHAPE BLOCKPAT :S(BLOCKGO)
        SHAPE NUMPAT :F(LIME1)
        IDENT(NTSHAP,'LINES') :S(LINEGO)
        IDENT(NTSHAP,'COLUMNS') :S(COLGO)F(LIME2)
LIME1   SHAPE COOPAT :F(LIME2)
        IDENT(CTSHAP,'BOXES') :S(BOXGO)
        IDENT(CTSHAP,'STRINGS') :S(STRGO)F(LIME2)
LIME2   OUTLISTING = OUTLISTING_ERROR 'INCORRECT SEGLIST SPEC' :(RETURN)
        BLOCKGO SEGM COORDPAIRS = :F(MALFORMEDSEGLIST)
        HEAD = SEGMENT(SVS1,SVS2,SVS3)
        FINDSEGLIST = HEAD
        CURRENT = HEAD
LOOPBL  SEGM COORDPAIRS = :F(RETURN)
        NEXT(CURRENT) = SEGMENT(SVS1,SVS2,SVS3)
        CURRENT = NEXT(CURRENT) :(LOOPBL)
LINEGO  HEAD = SEGMENT(LEMON1,1,'*')
*       OUTPUT = 'AT LINEGO:' LEMON1 ' 1-*'
        FINDSEGLIST = HEAD
        CURRENT = HEAD
LOOPLN  EQ(LEMON1,LEMON2) :S(RETURN)
        LEMON1 = LEMON1 + 1
        NEXT(CURRENT) = SEGMENT(LEMON1,1,'*')
        CURRENT = NEXT(CURRENT) :(LOOPLN)
COLGO   FINDSEGLIST = SEGMENT('*',LEMON1,LEMON2) :(RETURN)
BOXGO   HEAD = SEGMENT(LEMON1,LEMON2,LEMON4)
        FINDSEGLIST = HEAD
        CURRENT = HEAD
LOOPBX  EQ(LEMON1,LEMON3) :S(RETURN)
        LEMON1 = LEMON1 + 1
        NEXT(CURRENT) = SEGMENT(LEMON1,LEMON2,LEMON4)
        CURRENT = NEXT(CURRENT) :(LOOPBX)
STRGO   FINDSEGLIST = SEGMENT(LEMON1,LEMON2,LEMON4) :(RETURN)
ENDFINDSEGLIST

-STITL      GETKEYSEG

        DEFINE('GETKEYSEG(KEY,PG)') :(ENDGETKEYSEG)
GETKEYSEG
        KEY COORDPAIRS :F(BADKEYINGETKEYSEG)
        DIFFER(SVS1,'*') DIFFER(SVS2,'*') DIFFER(SVS3,'*')
+       :F(BADKEYINGETKEYSEG)
        GETKEYSEG = SUBSTR(PG< SVS1> ,SVS2,SVS2 - SVS3 + 1)
+       :(RETURN)
ENDGETKEYSEG
-STITL      GETINTERPAGE

**                                          **
        DEFINE('GETINTERPAGE(FILE,INAME)') :(ENDGETINTERPAGE)
GETINTERPAGE
        IDENT(HOLDPAGE< INAME> ,NULL) :S(GETNEWONE)
        GETINTERPAGE = HOLDPAGE< INAME> :(RETURN)
GETNEWONE
        HOLDPAGE< INAME> = READAPAGE(FILE) :F(TZ1)
        GETINTERPAGE = HOLDPAGE< INAME> :(RETURN)
TZ1     IDENT(ISFIRSTEOF< INAME> ,NULL) :F(TZ2)
        ISFIRSTEOF< INAME> = 'NO'
```

```
TZ2   HOLDPAGE< INAME> = COPY(NULLARRAY)
      GETINTERPAGE = HOLDPAGE< INAME>  :(RETURN)
ENDGETINTERPAGE

-STITL      GETSTMT –I–

*     THIS ROUTINE WILL READ A STATEMENT FROM INPUT, AND WILL RETURN IT.
*     STATEMENTS END WITH ;, HOWEVER THERE IS CURRENTLY ONLY ONE
*     STATEMENT PER LINE THE INPUT IS WRITTEN TO A LISTING FILE
      GETSTMT_LINE_NUMBER = 0
      GETSTMT_STMT_NUMBER = 0

      DEFINE('GETSTMT()STARTPOS,SEMIPOS,C1,C2,LINE')
+                  :(END_GETSTMT)
GETSTMT GETSTMT =
      GETSTMT_STMT_NUMBER = GETSTMT_STMT_NUMBER + 1
      S1 =
      S2 =
      WSET =
      CONT =
      STARTPOS = 0
NEXTLIN_GETSTMT
+     LINE = INPUT                  :F(FRETURN)
      LINE = DIFFER(TRIMSTMT,NULL) SUBSTR(LINE,1,TRIMSTMT)
      GETSTMT_LINE_NUMBER = GETSTMT_LINE_NUMBER + 1
      OUTLISTING =   LPAD(GETSTMT_LINE_NUMBER,5)
+             LPAD(GETSTMT_STMT_NUMBER,7)
+             "   " LINE
      GETSTMT = IDENT(GETSTMT,NULL) LINE
+                        :F(CONTILIN_GETSTMT)
      GETSTMT POS(0) '*'    :S(RETURN)F(MATCHIT_GETSTMT)
CONTILIN_GETSTMT
+     GETSTMT = GETSTMT ' ' LINE
MATCHIT_GETSTMT
+     GETSTMT BREAK(';') ';' @SEMIPOS *GT(SEMIPOS,STARTPOS)
+                        :F(NEXTLIN_GETSTMT)
      GETSTMT @C1 ELITERAL @C2 *GT(C2,SEMIPOS)
+     *LT(C1,SEMIPOS)              :F(RETURN_GETSTMT)
      STARTPOS = SEMIPOS            :(MATCHIT_GETSTMT)
RETURN_GETSTMT
      GETSTMT = SUBSTR(GETSTMT,1,SEMIPOS)   :(RETURN)
END_GETSTMT

-STITL      GRABCLOUD

      DEFINE('GRABCLOUD(PAGE,PAT)CLOUDTEMP,IC,PGS')
+     :(ENDGRABCLOUD)
GRABCLOUD
      &ANCHOR = DEFAULTCLOUDPATANCHOR
      IC = 1
      IDENT(PAGE< IC> ,NULL)   :S(OUTLINE3)
NLINE3 PGS = PGS BOL IC BOL PAGE< IC>
      IDENT(PAGE< IC> ,BOL)    :S(OUTLINE3)
      PAGE< IC>          :F(OUTLINE3)
      IC = IC + 1        :(NLINE3)
OUTLINE3
```

```
    PGS PAT . CLOUDTEMP
    &ANCHOR = DEFAULTANCHOR
    GRABCLOUD = CLOUDTEMP  :(RETURN)
ENDGRABCLOUD

-STITL      GRABNOTCLOUD

    DEFINE('GRABNOTCLOUD(PAGE,PAT)PGS,IC')
+     :(ENDGRABNOTCLOUD)
GRABNOTCLOUD
    &ANCHOR = DEFAULTCLOUDPATANCHOR
    IC = 1
    IDENT(PAGE< IC> ,NULL)   :S(OUTLINE2)
NLINE2  PGS = PGS BOL IC BOL PAGE< IC>
    IDENT(PAGE< IC> ,BOL)    :S(OUTLINE2)
    PAGE< IC>              :F(OUTLINE2)
    IC = IC + 1          :(NLINE2)
OUTLINE2
    PGS PAT =
    &ANCHOR = DEFAULTANCHOR
    GRABCLOUD = PGS      :(RETURN)
ENDGRABNOTCLOUD

-STITL      INITIALIZATION

    DEFINE('INITIALIZE()')  :(INITIALIZEEND)
INITIALIZE
    ON = 1
    OFF = 0
    DEFAULTANCHOR = 1
    DEFAULTWITH = ' '
    DEFAULTCLOUDPATANCHOR = 0
    DEFAULTCLOUDWITHEVAL = 1
    DEFAULTCLOUDDUPL = 0
    DEFAULTREAD = 'ROUNDROBIN'
    LOOPCHECKING = 'ON'
    OTHERWISEOPT = NULL
*   INSERT ASCII EBCDIC CHECK HERE AND ALSO DONT FORGET
    MACHINE = LLT('A',1) 'IBM'
    MACHINE =   LLT('A',1) 'UNIX' :F(NOTUNIX_INITIALIZE)
    HOST() ARB "SUN" . MACHINE ARB  :F(NOTUNIX_INITIALIZE)
    MACHINE_INPUT_ARG_3 = " -B1024"
NOTUNIX_INITIALIZE
    IBMCC = 1
    MAXCOMPARES = 20
    OPENINPUTFILES = 0

*   SET WHEN FILE IS OPENED - USED BY READAPAGE
    DATA("READAPAGE_NODE(RAPN_IOVARNAME,RAPN_PAGENO,RAPN_LINE,"
+                   "RAPN_IBMCC,RAPN_PAGESTART,"
+                   "RAPN_BLANKCOUNT,"
+                   "RAPN_EOF"
+                   ")")
    READAPAGE_MASTERTABLE = TABLE(100)
    OPENIN_GENSYM_COUNTER = 0
```

```
        PAGESIZE = 66
        &TRIM = 1
        IDENT(MACHINE,'IBM') :F(NOTIBM)
        &FULLSCAN = 1
NOTIBM  &ANCHOR = DEFAULTANCHOR
        &STLIMIT = 1000000000
        &MAXLNGTH = 32758
        PAGESTART = '1'
        LABCNT = 1
        PAGETAB = TABLE(100)
        ISFIRSTEOF = TABLE(50)
        HOLDPAGE = TABLE(50)
        BOL = SUBSTR(&ALPHABET,004,1)
        NC = SUBSTR(&ALPHABET,009,1)
        EOF = SUBSTR(&ALPHABET,005,1)
        FORMFEED = DIFFER(MACHINE,"IBM") SUBSTR(&ALPHABET,7,1)
        TEMPASSO = TABLE(100)
        NONCOMP = TABLE(100)
        CODETAB = TABLE(100)
        REMEMBERY = TABLE(50)
        MAXFILE = 10
        INPUTTAB = TABLE(MAXFILE)
        WSPGCOUNT = TABLE(20,0)
        SEGTAB = TABLE(20)
        OUTFILETAB = TABLE(MAXFILE)
        NONUSINGINS = TABLE(MAXFILE)
        COMPAIRETAB = TABLE(100)
        TRIMCOMPARE = 'YES'
        OPPVRB = TABLE(3)
        OPPVRB< 'CHOOSE'> = 'REMOVE'
        OPPVRB< 'REMOVE'> = 'CHOOSE'
        OPPVRB< 'REB'> = 'REPLACE'
        UNDERLINE = '+' DUPL('_',131)
*       UNDERLINE = '+' DUPL('_',132)
        BLANKLINE = ' '
        INPUTFILENO = 0
        IDENT(MACHINE,'IBM') INPUT('INPUT')
*       IDENT(MACHINE,'UNIX') INPUT('INPUT','INPUT','INPUT')
        IDENT(MACHINE,'IBM') OUTPUT('OUTLISTING','LISTING')
        DIFFER(MACHINE,'IBM') OUTPUT('OUTLISTING',
+       'OUTLISTING','LISTING -W')
        OUTLISTING_ERROR = "ERROR *****    "
        OUTLISTING_MSG  = "***** *****    "
        OUTLISTING = ''
        OUTLISTING = DUPL("*",72)
        OUTLISTING = "**" DUPL(" ",68) "**"

        OUTLISTING = "**" DUPL(" ",68) "**"
        OUTLISTING = DUPL("*",72)
        OUTLISTING = " "
        OUTLISTING = DUPL(' ',17)
+           'PHASER - PAGE HANDLING ANALYZER SYNTHESIZER'
        OUTLISTING = ''
        OUTLISTING =   "LINE#  STMT#    INPUT"
        OUTLISTING =   "=====  =====    ==================== ..."
        DATA('SEGMENT(LINEN,START,FINISH,NEXT)')
        DATA('MUSHSTACK(LINENY,STARTY,FINISHY,NEXTY)')
```

```
        DATA('DIFFLINES(VALUE,NEXTDIFF)')
        MAGICNUM = &MAXLNGTH + 1
        NULLARRAY = ARRAY('0:' PAGESIZE + 10)
        NULLARRAY< 1> = BOL
        EOFARRAY = ARRAY('0:5')
        EOFARRAY< 1> = BOL
        EOFARRAY< 0> = EOF
        PAGECNT = 1   :(RETURN)
    INITIALIZEEND

    -STITL      INTERSPERSE

        DEFINE('INTERSPERSE(INTERID,PAGE,FILEPAGE,NEWDD,KEY,KEY2,'
    +     'TYPE,REVERSED)TEMPPAGE')
    +     :(ENDINTERSPERSE)
    INTERSPERSE
        IDENT(PAGE< 1> ,BOL) IDENT(FILEPAGE< 1> ,BOL) :S(RETURN)
        IDENT(PAGE< 1> ,BOL) PRINTPAGE(FILEPAGE,NEWDD) :S(RETURN)
        IDENT(FILEPAGE< 1> ,BOL) PRINTPAGE(PAGE,NEWDD) :S(RETURN)
        KEYPAGE = GETKEYSEG(KEY,PAGE)
        KEYFILEPAGE = GETKEYSEG(KEY2,FILEPAGE)
        IDENT(KEYPAGE,KEYFILEPAGE)     :F(INTERSPERSE1)
        IDENT(REVERSED,'REVERSED') :S(INTERSPERSE0)
        MATCH(SMERGE,TYPE)
    +     PRINTPAGE(MRGSIDEBYSIDE(COPY(PAGE),COPY(FILEPAGE)),NEWDD)
    +     :S(CLEARBUFF)
        TEMPPAGE = MATCH(LMERGE,TYPE)
    +     PRINTPAGE(MRGLINEBYLINE(COPY(PAGE),COPY(FILEPAGE)),NEWDD)
    +     :S(CLEARBUFF)
        TEMPPAGE = MATCH(OMERGE,TYPE)
    +     PRINTPAGE(MRGONEAFTER(COPY(PAGE),COPY(FILEPAGE)),NEWDD)
    +     :(CLEARBUFF)
    INTERSPERSE0
        MATCH(SMERGE,TYPE)
    +     PRINTPAGE(MRGSIDEBYSIDE(COPY(FILEPAGE),COPY(PAGE)),NEWDD)
    +     :S(CLEARBUFF)
        TEMPPAGE = MATCH(LMERGE,TYPE)
    +     PRINTPAGE(MRGLINEBYLINE(COPY(FILEPAGE),COPY(PAGE)),NEWDD)
    +     :S(CLEARBUFF)
        TEMPPAGE = MATCH(OMERGE,TYPE)
    +     PRINTPAGE(MRGONEAFTER(COPY(FILEPAGE),COPY(PAGE)),NEWDD)
    +     :(CLEARBUFF)
    INTERSPERSE1
        LLT(KEYPAGE,KEYFILEPAGE) :F(INTERSPERSE2)
        PRINTPAGE(PAGE,NEWDD) :(RETURN)
    INTERSPERSE2
    *   LGT(KEYPAGE,KEYFILEPAGE)
        PRINTPAGE(FILEPAGE,NEWDD)
        HOLDPAGE(INTERID) = NULL :(FRETURN)
    CLEARBUFF
        HOLDPAGE(INTERID) = NULL :(RETURN)
    ENDINTERSPERSE

    -STITL      ISALOOP

        DEFINE('ISALOOP()')          :(ENDISALOOP)
    ISALOOP
```

```
        CALLSTRING ARB ';' DEP2 (BREAK(';') | RPOS(0))
+               :S(RETURN)F(FRETURN)
ENDISALOOP

-STITL      KMIN

        DEFINE('KMIN(NUM1,NUM2)') :(ENDKMIN)
KMIN
        KMIN = LE(NUM1,NUM2) NUM1 :S(RETURN)
        KMIN = NUM2 :(RETURN)
ENDKMIN

-STITL      MATCH

        DEFINE('MATCH(PATTRN,STRNG)')       :(ENDMATCH)
MATCH
        STRNG PATTRN            :S(RETURN) F(FRETURN)
ENDMATCH

-STITL      MATCHSEGS

        DEFINE('MATCHSEGS(PATT,HEAD,PAGE)CURRENT,'
+       'ST,FN,CNTR,LASTLINE,TEMPCNTR') :(ENDMATCHSEGS)
MATCHSEGS
        CURRENT = HEAD
        LASTLINE = 0
        &ANCHOR = 0
MNEXT   IDENT(LINEN(CURRENT),'*') :S(ALLLINE)
        TEMPCNTR = 0
MMNEX   ?(PAGE< TEMPCNTR + 1> ) :F(MMNEX1)
        TEMPCNTR = TEMPCNTR + 1
        IDENT(PAGE< TEMPCNTR> ,BOL) :S(FRETURN)
        EQ(LINEN(CURRENT),TEMPCNTR) :F(MMNEX)
MMNEX1  IDENT(FINISH(CURRENT),'*') :S(STFINIS)
        PAGE< LINEN(CURRENT)>  @ST PATT @FN
+       *EQ(ST + 1,START(CURRENT))
+       *EQ(FN,FINISH(CURRENT)) :S(RETURN)F(MNEXT1)
STFINIS PAGE< LINEN(CURRENT)>  @ST PATT @FN
+       *EQ(ST + 1,START(CURRENT))
+       *EQ(FN,SIZE(PAGE< LINEN(CURRENT)> )) :S(RETURN)
MNEXT1  LASTLINE = LINEN(CURRENT)
        CURRENT = DIFFER(NEXT(CURRENT),NULL) NEXT(CURRENT)
+       :S(MNEXT)F(FRETURN)
ALLLINE CNTR = ?(PAGE< CNTR + 1> ) LASTLINE + 1 :F(FRETURN)
        IDENT(PAGE< CNTR> ,BOL) :S(FRETURN)
ALLLIN3 IDENT(FINISH(CURRENT),'*') :S(STFINI2)
        PAGE< CNTR>  @ST PATT @FN
+       *EQ(ST + 1,START(CURRENT))
+       *EQ(FN,FINISH(CURRENT)) :S(RETURN)F(MNEXT2)
STFINI2 PAGE< CNTR>  @ST PATT @FN
+       *EQ(ST + 1,START(CURRENT))
+       *EQ(FN,SIZE(PAGE< CNTR> )) :S(RETURN)
MNEXT2  CNTR = ?(PAGE< CNTR + 1> ) CNTR + 1
+       :F(FRETURN)
        IDENT(PAGE< CNTR> ,BOL) :S(FRETURN)F(ALLLIN3)
ENDMATCHSEGS
```

```
-STITL      MATCHWHOLEPAGE
        DEFINE('MATCHWHOLEPAGE(PATT,PAGE)CNTR')
+                       :(ENDMATCHWHOLEPAGE)
MATCHWHOLEPAGE
        &ANCHOR = 0
        CNTR = 1
NEWL    PAGE< CNTR> PATT        :S(RETURN)
        IDENT(PAGE< CNTR> ,BOL)  :S(FRETURN)
        CNTR = CNTR + 1         :(NEWL)
ENDMATCHWHOLEPAGE

-STITL      MRGLINEBYLINE

        DEFINE('MRGLINEBYLINE(PAGE1,PAGE2)COUNT1,COUNT2,BIGCOUNT')
+                               :(END_MRGLINEBYLINE)
MRGLINEBYLINE
        MRGLINEBYLINE = NOTNULLPG(PAGE1)  NOTNULLPG(PAGE2)
+                       COPY(NULLARRAY)    :S(RETURN)
*       MRGLINEBYLINE =  NOTNULLPG(PAGE1) COPY(PAGE2)      :S(RETURN)
        MRGLINEBYLINE =  NOTNULLPG(PAGE2) COPY(PAGE1)      :S(RETURN)
*       MRGLINEBYLINE = IDENT(PAGE1< 1> ,BOL) COPY(PAGE2)    :S(RETURN)
*       MRGLINEBYLINE = IDENT(PAGE2< 1> ,BOL) COPY(PAGE1)    :S(RETURN)
        MRGLINEBYLINE = IDENT(PAGE1< 0> ,EOF) IDENT(PAGE2< 0> ,EOF)
+               COPY(EOFARRAY)              :S(RETURN)
        MRGLINEBYLINE = COPY(NULLARRAY)
        COUNT1 = 0
        COUNT2 = 0
        BIGCOUNT = 0
MAIN_MRGLINEBYLINE
+       BIGCOUNT =  BIGCOUNT + 1
        MRGLINEBYLINE =  (MRGLINEBYLINE< BIGCOUNT> )
+               ENLARGEPAGE(MRGLINEBYLINE)
        COUNT1 = COUNT1 + 1
        MRGLINEBYLINE< BIGCOUNT> = DIFFER(PAGE1< COUNT1> ,BOL)
+                       PAGE1< COUNT1>
        BIGCOUNT = BIGCOUNT + 1
        MRGLINEBYLINE =  (MRGLINEBYLINE< BIGCOUNT> )
+               ENLARGEPAGE(MRGLINEBYLINE)
        COUNT2 = COUNT2 + 1
        MRGLINEBYLINE< BIGCOUNT> = DIFFER(PAGE2< COUNT2> ,BOL)
+               PAGE2< COUNT2>
+               :F(ONEONLY_MRGLINEBYLINE)S(MAIN_MRGLINEBYLINE)
TWOONLY_MRGLINEBYLINE
+       MRGLINEBYLINE< BIGCOUNT> = PAGE2< COUNT2>
        IDENT(PAGE2< COUNT2> ,BOL) :S(RETURN)
        BIGCOUNT = BIGCOUNT + 1
        MRGLINEBYLINE =  (MRGLINEBYLINE< BIGCOUNT> )
+               ENLARGEPAGE(MRGLINEBYLINE)
        COUNT2 = COUNT2 + 1             :(TWOONLY_MRGLINEBYLINE)
ONEONLY_MRGLINEBYLINE
+       MRGLINEBYLINE< BIGCOUNT> = PAGE1< COUNT1>
        IDENT(PAGE1< COUNT1> ,BOL)              :S(RETURN)
        BIGCOUNT =  BIGCOUNT + 1
        MRGLINEBYLINE =  (MRGLINEBYLINE< BIGCOUNT> )
+               ENLARGEPAGE(MRGLINEBYLINE)
```

```
40      COUNT1 = COUNT1 + 1                :(ONEONLY_MRGLINEBYLINE)
    END_MRGLINEBYLINE

    -STITL      MRGONEAFTERANOTHER - MRGONE.S

        MRGONEAFTER =  NOTNULLPG(PAGE1)  NOTNULLPG(PAGE2)
    +                  COPY(NULLARRAY) :S(RETURN)
45      MRGONEAFTER =  NOTNULLPG(PAGE1) COPY(PAGE2) :S(RETURN)
        MRGONEAFTER =  NOTNULLPG(PAGE2) COPY(PAGE1) :S(RETURN)
    *   MRGONEAFTER = IDENT(PAGE1< 1> ,BOL) COPY(PAGE2) :S(RETURN)
    ** PLEASE NOTE, LINE ABOVE TAKES CARE OF BOTH NULL CASES ALSO
    *   MRGONEAFTER = IDENT(PAGE2< 1> ,BOL) COPY(PAGE1) :S(RETURN)
50      MRGONEAFTER = IDENT(PAGE1< 0> ,EOF) IDENT(PAGE2< 0> ,EOF)
    +           COPY(EOFARRAY)          :S(RETURN)
        MRGONEAFTER = COPY(PAGE1)
        MRGONEAFTER< 0> = NULL
        CNT2 = 0
 5      CNT = 0
    MTP1_MRGONEAFTER
    +   CNT = CNT + 1
        ?(MRGONEAFTER< CNT> ) DIFFER(MRGONEAFTER< CNT> ,BOL)
    +                          :S(MTP1_MRGONEAFTER)
10  MTP2_MRGONEAFTER
    +   CNT2 = CNT2 + 1
        MRGONEAFTER =  (MRGONEAFTER< CNT> ) ENLARGEPAGE(MRGONEAFTER)
        ?(PAGE2< CNT2> ) DIFFER(PAGE2< CNT2> ,BOL)    :F(RETURN)
        MRGONEAFTER< CNT> = PAGE2< CNT2>
15      CNT = CNT + 1                  :S(MTP2_MRGONEAFTER)
    END_MRGONEAFTER

    -STITL      MRGSIDEBYSIDE

        MRGSIDEBYSIDE =  NOTNULLPG(PAGE2)  NOTNULLPG(PAGE1)
    +           COPY(NULLARRAY)
20      MRGSIDEBYSIDE =  NOTNULLPG(PAGE2) COPY(PAGE1)  :S(RETURN)
        MRGSIDEBYSIDE =  NOTNULLPG(PAGE1) COPY(PAGE2)  :S(RETURN)
    *   MRGSIDEBYSIDE = IDENT(PAGE2) IDENT(PAGE1) COPY(NULLARRAY)
    *+                          :S(RETURN)
    *   MRGSIDEBYSIDE = IDENT(PAGE2) COPY(PAGE1)      :S(RETURN)
25  *   MRGSIDEBYSIDE = IDENT(PAGE1) COPY(PAGE2)      :S(RETURN)
    *   MRGSIDEBYSIDE = IDENT(PAGE1< 1> ,BOL) COPY(PAGE2) :S(RETURN)
    *   MRGSIDEBYSIDE = IDENT(PAGE2< 1> ,BOL) COPY(PAGE1) :S(RETURN)
        MRGSIDEBYSIDE = IDENT(PAGE1< 0> ,EOF) IDENT(PAGE2< 0> ,EOF)
    +           COPY(EOFARRAY)      :S(RETURN)
30      CNT = 0
        MRGSIDEBYSIDE = COPY(PAGE1)
        MRGSIDEBYSIDE< 0> = NULL
    PHASE1_MRGSIDEBYSIDE
    +   CNT = CNT + 1
35      MRGSIDEBYSIDE =  (MRGSIDEBYSIDE< CNT> ) ENLARGEPAGE(MRGSIDEBYSIDE)
        IDENT(MRGSIDEBYSIDE< CNT> ,BOL)      :S(PHASE2_MRGSIDEBYSIDE)
        IDENT(PAGE2< CNT> ,BOL)          :S(RETURN)
        MRGSIDEBYSIDE< CNT> = MRGSIDEBYSIDE< CNT> PAGE2< CNT>
    +                      :S(PHASE1_MRGSIDEBYSIDE)
40  PHASE2_MRGSIDEBYSIDE
    +   MRGSIDEBYSIDE< CNT> = PAGE2< CNT>
```

```
        IDENT(PAGE2< CNT> ,BOL)              :S(RETURN)
        CNT = CNT + 1
        MRGSIDEBYSIDE =   (MRGSIDEBYSIDE< CNT> ) ENLARGEPAGE(MRGSIDEBYSIDE)
45  +                        :(PHASE2_MRGSIDEBYSIDE)
    END_MRGSIDEBYSIDE

    -STITL      MUSHBYSEGS

        DEFINE('MUSHBYSEGS(VRB,WTH,PAGE,HEAD)LASTLINE,CNTR,'
    +     'MUSHCUR1,MUSHCUR2,CURRENTLY,CURRENT,TEMPLINE,WTHLEN,'
    +     'CNTR2,NULLINES')          :(ENDMUSHBYSEGS)
    MUSHBYSEGS
        MUSHBYSEGS = PAGE
 5      &ANCHOR = 0
        LASTLINE = 0
        CURRENT = HEAD :F(BADHEAD)
        IDENT(CURRENT,NULL) DIFFER(VRB,'CHOOSE') :S(RETURN)
        PAGE< 1> = IDENT(CURRENT,NULL) BOL :S(RETURN)
10  *
    *     REMOVE CODE
    *
    LO1   IDENT(VRB,'REMOVE')    :F(CHOV)
    LO2   IDENT(LINEN(CURRENT),'*') :S(RMRESTOFLINES)
15      MUSHCUR1 =
    +     MUSHSTACK(LINEN(CURRENT),START(CURRENT),FINISH(CURRENT))
    NEXLE  CURRENT = DIFFER(NEXT(CURRENT),NULL)
    +     EQ(LINEN(CURRENT),LINEN(NEXT(CURRENT)))
    +     NEXT(CURRENT)  :F(DESTACK)
20      MUSHCUR2 = MUSHSTACK(LINEN(CURRENT),START(CURRENT),
    +     FINISH(CURRENT))
        NEXTY(MUSHCUR2) = MUSHCUR1
        MUSHCUR1 = MUSHCUR2  :(NEXLE)
    DESTACK CURRENTLY = MUSHCUR1
25  DEST10 IDENT(FINISHY(CURRENTLY),'*') :F(RMNUMNUM)
        PAGE< LINENY(CURRENTLY)> = EQ(STARTY(CURRENTLY),1) NULL
    +     :S(RMNEXX)
        PAGE< LINENY(CURRENTLY)> POS(STARTY(CURRENTLY) - 1) REM =
    +     :(RMNEXX)
30  RMNUMNUM
        PAGE< LINENY(CURRENTLY)>
    +     POS(STARTY(CURRENTLY) - 1) LEN(FINISHY(CURRENTLY)
    +     - STARTY(CURRENTLY) + 1) =
    RMNEXX CURRENTLY = DIFFER(NEXTY(CURRENTLY),NULL) NEXTY(CURRENTLY)
35  +     :S(DEST10)
        LASTLINE = LINENY(CURRENTLY)
        CURRENT = DIFFER(NEXT(CURRENT),NULL) NEXT(CURRENT)
    +          :F(XRETURN)S(LO2)
    RMRESTOFLINES
40      TEMPLINE = ?(PAGE< LASTLINE + 1> )  NULL :F(XRETURN)
        IDENT(PAGE< LASTLINE + 1> ,BOL) :S(XRETURN)
        PAGE< LASTLINE + 1> = EQ(START(CURRENT),1)
    +     IDENT(FINISH(CURRENT),'*') BOL :S(XRETURN)
        CNTR = LASTLINE
45      MUSHCUR1 =
    +     MUSHSTACK(LINEN(CURRENT),START(CURRENT),FINISH(CURRENT))
    NEXLE2 CURRENT = DIFFER(NEXT(CURRENT),NULL)
```

```
+     IDENT(LINEN(NEXT(CURRENT)),'*') NEXT(CURRENT) :F(NEWLYN)
      MUSHCUR2 = MUSHSTACK(LINEN(CURRENT),START(CURRENT),
+     FINISH(CURRENT))
      NEXTY(MUSHCUR2) = MUSHCUR1
      MUSHCUR1 = MUSHCUR2  :(NEXLE2)
NEWLYN CNTR = ?(PAGE< CNTR + 1> ) CNTR + 1 :F(XRETURN)
      IDENT(PAGE< CNTR> ,BOL) :S(XRETURN)
      CURRENTLY = MUSHCUR1
SAMELIN IDENT(FINISHY(CURRENTLY),'*') :F(RM1)
RM2   PAGE< CNTR> POS(STARTY(CURRENTLY) - 1) REM =  :(LO21)
RM1   PAGE< CNTR> POS(STARTY(CURRENTLY) - 1)
+     LEN(FINISHY(CURRENTLY) - STARTY(CURRENTLY) + 1) =
LO21  CURRENTLY = DIFFER(NEXTY(CURRENTLY),NULL)
+     NEXTY(CURRENTLY) :F(NEWLYN)S(SAMELIN)
*
*     CHOOSE CODE
*
CHOV  IDENT(VRB,'CHOOSE')  :F(REPLC)
      CNTR = ?(PAGE< 1> ) 1 :F(RETURN)
      IDENT(PAGE< CNTR> ,BOL) :S(RETURN)
CHO2  IDENT(LINEN(CURRENT),'*')  :S(CHRESTOFLINES)
      EQ(CNTR,LINEN(CURRENT)) :F(ICHL)
      TEMPLINE = PAGE< CNTR>
      PAGE< CNTR> = NULL
DEST1 IDENT(FINISH(CURRENT),'*') :F(ICHL3)
      PAGE< LINEN(CURRENT)> = EQ(START(CURRENT),1)
+     PAGE< LINEN(CURRENT)> TEMPLINE :(ICHL2)
      PAGE< LINEN(CURRENT)> = PAGE< LINEN(CURRENT)>
+     SUBSTR(TEMPLINE,START(CURRENT)) :(ICHL2)
ICHL3 PAGE< LINEN(CURRENT)> = PAGE< LINEN(CURRENT)>
+     SUBSTR(TEMPLINE,
+     START(CURRENT),FINISH(CURRENT) - START(CURRENT)
+     + 1)
ICHL2 LASTLINE = LINEN(CURRENT)
      CURRENT = DIFFER(NEXT(CURRENT),NULL) NEXT(CURRENT) :F(HIT)
      IDENT(LASTLINE,LINEN(CURRENT)) :S(DEST1)F(ICHL0)
HIT   PAGE< LINEN(CURRENT) + 1> = BOL :(XRETURN)
ICHL  PAGE< CNTR> = NULL
ICHL0 CNTR = ?(PAGE< CNTR + 1> ) CNTR + 1 :F(XRETURN)
      IDENT(PAGE< CNTR> ,BOL) :S(XRETURN)F(CHO2)
CHRESTOFLINES
      CNTR = LASTLINE
CHR0  CNTR = ?(PAGE< CNTR + 1> ) CNTR + 1 :F(XRETURN)
      IDENT(PAGE< CNTR> ,BOL) :S(XRETURN)
      TEMPLINE = PAGE< CNTR>
      PAGE< CNTR> = NULL
      CURRENT2 = CURRENT
CHR00 IDENT(FINISH(CURRENT2),'*') :F(CHR1)
      PAGE< CNTR> = EQ(START(CURRENT2),1) PAGE< CNTR>
+     TEMPLINE :(CHR2A)
CHR2  PAGE< CNTR> = PAGE< CNTR> SUBSTR(TEMPLINE,START(CURRENT2))
+     :(CHR2A)
CHR1  PAGE< CNTR> = PAGE< CNTR> SUBSTR(TEMPLINE,START(CURRENT2),
+     FINISH(CURRENT2) - START(CURRENT2) + 1)
CHR2A CURRENT2 = DIFFER(NEXT(CURRENT2),NULL)
+     IDENT(LINEN(NEXT(CURRENT2)),'*') NEXT(CURRENT2) :F(CHR0)
+     S(CHR00)
```

```
*
*    XRETURN CODE COMPRESSES CHOOSE AND REMOVE VERTICALLY
*    IT MAY BE INCORPORATED INTO THEIR ALGOS AS NECESSARY
*
XRETURN NULLINES = 0
    CNTR2 = 0
BUMPCNTR2
    CNTR2 = ?(PAGE< CNTR2 + 1> ) CNTR2 + 1 :F(RETURN)
    NULLINES = IDENT(PAGE< CNTR2> ,NULL) NULLINES + 1
+   :S(BUMPCNTR2)
    PAGE< CNTR2 - NULLINES> = GT(NULLINES,0) PAGE< CNTR2>
    IDENT(PAGE< CNTR2> ,BOL) :S(RETURN)F(BUMPCNTR2)

*
*    REPLACE CODE
*
REPLC  IDENT(VRB,'REPLACE') :F(BADVERBINMUSHBYSEGS)
    WTH = IDENT(WTH,NULL) DEFAULTWITH
    WTHLEN = SIZE(WTH)
REPO1  IDENT(LINEN(CURRENT),'*') :S(REPRESTOFLINES)
    ?(PAGE< LINEN(CURRENT)> ) :F(RETURN)
    IDENT(PAGE< LINEN(CURRENT)> ,BOL) :S(RETURN)
    IDENT(FINISH(CURRENT),'*') :F(REPNUMNUM)
    PAGE< LINEN(CURRENT)> = EQ(START(CURRENT),1)
+     SUBSTR(DUPL(WTH,SIZE(PAGE< LINEN(CURRENT)> ) / WTHLEN + 1),
+       1,SIZE(PAGE< LINEN(CURRENT)> ))          :S(REPNEXX)
    PAGE< LINEN(CURRENT)> =
+     SUBSTR(PAGE< LINEN(CURRENT)> ,1,START(CURRENT) - 1)
+     LE(START(CURRENT),SIZE(PAGE< LINEN(CURRENT)> ))
+     SUBSTR(DUPL(WTH,(SIZE(PAGE< LINEN(CURRENT)> ) - START(CURRENT)
+       + 1) / WTHLEN + 1),1,SIZE(PAGE< LINEN(CURRENT)> ) -
+       START(CURRENT) + 1)                    :(REPNEXX)
REPNUMNUM
    PAGE< LINEN(CURRENT)> = EQ(START(CURRENT),1)
+       SUBSTR(DUPL(WTH,((FINISH(CURRENT) - START(CURRENT) + 1)
+       / WTHLEN) + 1),1,
+       KMIN(FINISH(CURRENT) - START(CURRENT) + 1,
+       SIZE(PAGE< LINEN(CURRENT)> )))
+       SUBSTR(PAGE< LINEN(CURRENT)> ,FINISH(CURRENT) + 1)
+                                  :S(REPNEXX)
    PAGE< LINEN(CURRENT)> = SUBSTR(PAGE< LINEN(CURRENT)> ,1,
+     START(CURRENT) - 1) LE(START(CURRENT),
+     SIZE(PAGE< LINEN(CURRENT)> ))
+     SUBSTR(DUPL(WTH,((FINISH(CURRENT) - START(CURRENT) + 1) /
+     WTHLEN) + 1),1,KMIN(FINISH(CURRENT) - START(CURRENT) + 1,
+     SIZE(PAGE< LINEN(CURRENT)> )))
+     SUBSTR(PAGE< LINEN(CURRENT)> ,FINISH(CURRENT) + 1)
REPNEXX LASTLINE = LINEN(CURRENT)
    CURRENT = DIFFER(NEXT(CURRENT),NULL)
+    NEXT(CURRENT) :F(RETURN)S(REPO1)
REPRESTOFLINES
    ?(PAGE< LASTLINE + 1> ) :F(RETURN)
    IDENT(PAGE< LASTLINE + 1> ,BOL) :S(RETURN)
REPREST2
    CNTR = LASTLINE + 1
    IDENT(FINISH(CURRENT),'*')    :F(REPO2)
```

```
    EQ(START(CURRENT),1)        :F(REPO3)
REPO4  PAGE< CNTR> =
+      SUBSTR(DUPL(WTH,SIZE(PAGE< CNTR> ) /
+      WTHLEN + 1),1,SIZE(PAGE< CNTR> ) )
       CNTR = ?(PAGE< CNTR + 1> ) CNTR + 1     :F(LO23)
       IDENT(PAGE< CNTR> ,BOL)  :S(LO23)F(REPO4)
REPO3  PAGE< CNTR> = SUBSTR(PAGE< CNTR> ,1,START(CURRENT) - 1)
+      LE(START(CURRENT),SIZE(PAGE< CNTR> ))
+      SUBSTR(DUPL(WTH,(SIZE(PAGE< CNTR> ) - START(CURRENT) + 1) /
+      WTHLEN + 1),1,SIZE(PAGE< CNTR> ) - START(CURRENT) + 1)
       CNTR = ?(PAGE< CNTR + 1> ) CNTR + 1     :F(LO23)
       IDENT(PAGE< CNTR> ,BOL)  :S(LO23)F(REPO3)
REPO2  PAGE< CNTR> = EQ(START(CURRENT),1)
+      SUBSTR(DUPL(WTH,((FINISH(CURRENT) - START(CURRENT) + 1) /
+      WTHLEN) + 1),1,KMIN(SIZE(PAGE< CNTR> ),
+      FINISH(CURRENT) - START(CURRENT) + 1))
+      SUBSTR(PAGE< CNTR> ,FINISH(CURRENT) + 1) :S(REPO5)
       PAGE< CNTR> = SUBSTR(PAGE< CNTR> ,1,START(CURRENT) - 1)
+      LE(START(CURRENT),SIZE(PAGE< CNTR> ))
+      SUBSTR(DUPL(WTH,((FINISH(CURRENT) - START(CURRENT) + 1) /
+      WTHLEN) + 1),1,KMIN(FINISH(CURRENT) - START(CURRENT) + 1,
+      SIZE(PAGE< CNTR> )))
+      SUBSTR(PAGE< CNTR> ,FINISH(CURRENT) + 1)
REPO5  CNTR = ?(PAGE< CNTR + 1> ) CNTR + 1     :F(LO23)
       IDENT(PAGE< CNTR> ,BOL)  :S(LO23)F(REPO2)
LO23   CURRENT = DIFFER(NEXT(CURRENT),NULL)
+      IDENT(LINEN(NEXT(CURRENT)),'*') NEXT(CURRENT) :F(RETURN)
+      S(REPREST2)
ENDMUSHBYSEGS

-STITL      MUSHCLOUD

      DEFINE('MUSHCLOUD(VRB,WTH,PG,CLOUDPAT)SAVVE2,TMUSHCLOUD,'
+      'SAVVE3,SAVVE1,LENWTH,LENSAV,IC,PGS,LENSAV1,LENSAV3')
+     :(ENDMUSHCLOUD)
MUSHCLOUD
      IC = 1
      IDENT(PG< IC> ,NULL)    :S(OUTLINE)
NLINE  PGS = PGS BOL IC BOL PG< IC>
      IDENT(PG< IC> ,BOL)     :S(OUTLINE)
      PG< IC>                 :F(OUTLINE)
      IC = IC + 1             :(NLINE)
OUTLINE &ANCHOR = DEFAULTCLOUDPATANCHOR
      IDENT(VRB,'REMOVE')     :F(CHOOSE)
      PGS CLOUDPAT =          :(CRETURN)
CHOOSE IDENT(VRB,'CHOOSE')    :F(REPLACE)
      PGS CLOUDPAT . TMUSHCLOUD
      PGS = TMUSHCLOUD        :(CRETURN)
REPLACE IDENT(VRB,'REPLACE')  :F(REB)
      PGS ARB . SAVVE1 CLOUDPAT . SAVVE2 REM . SAVVE3
      WTH = IDENT(WTH,NULL)  DEFAULTWITH
      WTH = IDENT(DEFAULTCLOUDWITHEVAL,1) EVAL(WTH)
      PGS = DIFFER(DEFAULTCLOUDDUPL,1)
+          SAVVE1 WTH SAVVE3     :S(CRETURN)
      LENWTH = SIZE(WTH)
      LENSAV = SIZE(SAVVE2)
```

```
        PGS = SAVVE1 SUBSTR(DUPL(WTH,(LENSAV / LENWTH) + 1),
10  +     1,LENSAV) SAVVE3     :(CRETURN)
    REB   IDENT(VRB,'REB') :F(BADVRBINMUSHCLOUD)
        PGS ARB . SAVVE1 CLOUDPAT . SAVVE2 REM . SAVVE3
        WTH = IDENT(WTH,NULL)  DEFAULTWITH
        WTH = IDENT(DEFAULTCLOUDWITHEVAL,1) EVAL(WTH)
15      PGS = DIFFER(DEFAULTCLOUDDUPL,1)
    +         WTH SAVVE2 WTH :S(CRETURN)
        LENWTH = SIZE(WTH)
        LENSAV1 = SIZE(SAVVE1)
        LENSAV3 = SIZE(SAVVE3)
20      PGS = SUBSTR(DUPL(WTH,(LENSAV1 / LENWTH) + 1),
    +     1,LENSAV1) SAVVE2 SUBSTR(DUPL(WTH,(LENSAV3 / LENWTH) + 1),
    +     1,LENSAV3)
    CRETURN IC = 1
    NEXTST  PGS BREAKX(BOL) . PGS2 BOL NUMBER BOL = :F(NULLL)
25      PG< IC> = PGS2
        IC = IC + 1    :(NEXTST)
    NULLL  PG< IC> = PGS
        PG< IC + 1> = BOL
        MUSHCLOUD = PG :(RETURN)
30  ENDMUSHCLOUD

    -STITL       MUSHRANGE

        DEFINE('MUSHRANGE(VRB,WTH,PAGE,FROM,TO)PAGENO')
    +                          :(ENDMUSHRANGE)
    MUSHRANGE
35      GE(WSPGCOUNT< DEPENDENT> ,FROM)  LE(WSPGCOUNT< DEPENDENT> ,TO)
    +             :F(FRETURN)
        MUSHRANGE = MUSHWHOLEPAGE(VRB,WTH,PAGE) :(RETURN)
    ENDMUSHRANGE

    -STITL       MUSHWHOLEPAGE

40      DEFINE('MUSHWHOLEPAGE(VRB,WTH,PG)WTHLEN,'
    +     'LINECNT,RPLAG')
    +                    :(ENDMUSHWHOLEPAGE)
    MUSHWHOLEPAGE
        MUSHWHOLEPAGE =   (DIFFER(VRB,'CHOOSE') DIFFER(VRB,'REB'))
45  +     PG :S(RETURN)
        IDENT(VRB,'REMOVE') :F(REP)
        PG< 1> = BOL
        MUSHWHOLEPAGE = PG    :(RETURN)
    REP   IDENT(VRB,'REPLACE')   :F(BADVERBINMUSHWHOLEPAGE)
        WTH = IDENT(WTH,NULL) DEFAULTWITH
        WTHLEN = SIZE(WTH)
        LINECNT = 1
 5  LOOPW  IDENT(PG< LINECNT> ,BOL)      :S(ARETURN)
        RPLAG = SIZE(PG< LINECNT> )
        PG< LINECNT> = SUBSTR(DUPL(WTH,(RPLAG / WTHLEN + 1)),1,RPLAG)
        LINECNT = LINECNT + 1 :(LOOPW)
    ARETURN MUSHWHOLEPAGE = PG :(RETURN)
10  ENDMUSHWHOLEPAGE

    -STITL       NOTNULLPG
```

```
      DEFINE('NOTNULLPG(PG)CNT')    :(ENDNOTNULLPG)
NOTNULLPG
          &ANCHOR = 1
      IDENT(PG,NULL)        :S(FRETURN)
      IDENT(PG< 1>,BOL)     :S(FRETURN)
      CNT = 1
CHECK IDENT(PG< CNT> ,NULL) :F(RETURN)
      ?(PG< CNT> )              :F(FRETURN)
      CNT = CNT + 1         :(CHECK)
ENDNOTNULLPG

-STITL      NOTSEGS

      DEFINE('NOTSEGS(HEAD)CNTR,CURRENT,NEWCURRENT')
+             :(ENDNOTSEGS)
NOTSEGS
      NOTSEGS = IDENT(HEAD,NULL) SEGMENT('*',1,'*') :S(RETURN)
      NOTSEGS = IDENT(LINEN(HEAD),'*') IDENT(START(HEAD),1)
+     IDENT(FINISH(HEAD),'*') NULL :S(RETURN)
      CURRENT = HEAD
      CNTR = 0
      NEWCURRENT = SEGMENT(0,0,0)
      NEWHEAD = NEWCURRENT
NS0   IDENT(LINEN(CURRENT),'*')    :S(NOTRESTOFLINES)
NS0A  CNTR = CNTR + 1
*     USE TO BE IDENT(LINEN(CURRENT),CNTR)   :F(WHOLELINE)
      EQ(LINEN(CURRENT),CNTR)      :F(WHOLELINE)
      NEXT(NEWCURRENT) =   EQ(START(CURRENT),1)
+     SEGMENT(LINEN(CURRENT),1,START(CURRENT) - 1) :F(NS1)
      NEWCURRENT = NEXT(NEWCURRENT)
NS1   NEXT(NEWCURRENT) = DIFFER(FINISH(CURRENT),'*')
+     DIFFER(NEXT(CURRENT),NULL) IDENT(LINEN(NEXT(CURRENT)),
+     LINEN(CURRENT)) SEGMENT(LINEN(CURRENT),FINISH(CURRENT)
+     + 1,START(NEXT(CURRENT)) - 1)  :F(NS2)
      NEWCURRENT = NEXT(NEWCURRENT)
      CURRENT = NEXT(CURRENT) :(NS1)
NS2   NEXT(NEWCURRENT) = DIFFER(FINISH(CURRENT),'*')
+     DIFFER(NEXT(CURRENT),NULL) DIFFER(LINEN(NEXT(CURRENT)),
+     LINEN(CURRENT)) SEGMENT(LINEN(CURRENT),FINISH(CURRENT) + 1,
+     '*') :F(NS3)
      NEWCURRENT = NEXT(NEWCURRENT)
      CURRENT = NEXT(CURRENT) :(NS0)
NS3   NEXT(NEWCURRENT) = DIFFER(FINISH(CURRENT),'*')
+     IDENT(NEXT(CURRENT),NULL) SEGMENT(LINEN(CURRENT),
+     FINISH(CURRENT) + 1,'*') :F(NS4)
      NEWCURRENT = NEXT(NEWCURRENT)
      NEXT(NEWCURRENT) = SEGMENT('*',1,'*')  :(STRPRET)
*NS4  CURRENT = IDENT(FINISH(CURRENT),'*') IDENT(NEXT(CURRENT),
*+    NULL) NEXT(CURRENT) :S(STRPRET)
NS4   NEXT(NEWCURRENT) = IDENT(FINISH(CURRENT),'*')
+     IDENT(NEXT(CURRENT),NULL) SEGMENT(LINEN(CURRENT) + 1,1,'*')
+     :F(NS4A)
      NEWCURRENT = NEXT(NEWCURRENT)
      NEXT(NEWCURRENT) = SEGMENT('*',1,'*')  :(STRPRET)
*     ASSUMES IDENT(FINISH(CURRENT),'*') AND DIFFER(NEXT(CURRENT),NULL)
NS4A  CURRENT = DIFFER(LINEN(NEXT(CURRENT)),LINEN(CURRENT))
```

```
+     NEXT(CURRENT) :F(DUPLLINESINNOTSEGS)S(NS0)
WHOLELINE
      NEXT(NEWCURRENT) = SEGMENT(CNTR,1,'*')
      NEWCURRENT = NEXT(NEWCURRENT) :(NS0A)
STRPRET NOTSEGS = NEXT(NEWHEAD) :(RETURN)
NOTRESTOFLINES
      NEXT(NEWCURRENT) = NEQ(START(CURRENT) - 1) SEGMENT('*',
+     1,START(CURRENT) - 1) :F(NS5)
      NEWCURRENT = NEXT(NEWCURRENT)
NS5   NEXT(NEWCURRENT) = DIFFER(FINISH(CURRENT),'*')
+     DIFFER(NEXT(CURRENT),NULL) IDENT(LINEN(NEXT(CURRENT)),'*')
+     SEGMENT('*',FINISH(CURRENT) + 1,START(NEXT(CURRENT)) - 1)
+     :F(NS6)
      NEWCURRENT = NEXT(NEWCURRENT)
      CURRENT = NEXT(CURRENT) :(NS5)
NS6   NEXT(NEWCURRENT) = DIFFER(FINISH(CURRENT),'*')
+     DIFFER(NEXT(CURRENT),NULL) DIFFER(LINEN(NEXT(CURRENT)),'*')
+     SEGMENT(LINEN(CURRENT),FINISH(CURRENT) + 1,'*') :S(STRPRET)
      NEXT(NEWCURRENT) = DIFFER(FINISH(CURRENT),'*')
+     IDENT(NEXT(CURRENT),NULL) SEGMENT(LINEN(CURRENT),
+     FINISH(CURRENT) + 1,'*') :S(STRPRET)
*     F ASSUMES IDENT(FINISH(CURRENT) AND DIFFER(NEXT(CURRENT),NULL)
*     REGARDLESS OF DIFFER(LINEN(NEXT(CURRENT)),LINEN(CURRENT))
      IDENT(FINISH(CURRENT),'*') IDENT(NEXT(CURRENT),NULL)
+     :S(STRPRET)F(LINEAFTERSTARNOTSEGS)
ENDNOTSEGS

-STITL      OPTM

      DEFINE('OPTM(HEAD)CURRENT,TEMPFINAL1,TEMPFINAL2')
+                    :(ENDOPTM)
OPTM
      OPTM = HEAD
      IDENT(HEAD,NULL) :S(RETURN)
      CURRENT = HEAD
OPTM1 IDENT(NEXT(CURRENT),NULL) :S(RETURN)
      CURRENT = DIFFER(LINEN(CURRENT),LINEN(NEXT(CURRENT)))
+           NEXT(CURRENT) :S(OPTM1)
      TEMPFINAL1 = IDENT(FINISH(CURRENT),'*') MAGICNUM :S(OPTM2)
      TEMPFINAL1 = FINISH(CURRENT)
OPTM2 TEMPFINAL2 = IDENT(FINISH(NEXT(CURRENT)),'*') MAGICNUM
+     :S(OPTM3)
      TEMPFINAL2 = FINISH(NEXT(CURRENT))
OPTM3 CURRENT = (GE(TEMPFINAL1,START(NEXT(CURRENT)))
+     GE(TEMPFINAL2,START(CURRENT))) NEXT(CURRENT) :S(OPTM1)
      START(CURRENT) = GT(START(CURRENT),START(NEXT(CURRENT)))
+     START(NEXT(CURRENT))
      FINISH(CURRENT) = LT(TEMPFINAL1,TEMPFINAL2) TEMPFINAL2
OPTM4 FINISH(CURRENT) = IDENT(FINISH(CURRENT),MAGICNUM) '*'
      NEXT(CURRENT) = NEXT(NEXT(CURRENT)) :(OPTM1)
ENDOPTM

-STITL      OPENIN - OPENIN.S

*     OPENIN WILL:
*       PERFORM THE INPUT CALL
```

```
*       INITILISE THE INPUT TABLE: READAPAGE_MASTERTABLE
*       INCREMENT: OPENINPUTFILES
*
*     OPENIN WILL RETURN THE NAME OF THE IOVAR THAT HAS BEEN ASSICIATED WITH
*       THE FILE.
*
*     OPENIN USES THE FOLLOWING EXTERNAL STUFF:
*       OPENIN_GENSYM_COUNTER  -> USED TO PRODUCE UNIQUE IOVARS
*       OPENINPUTFILES        -> COUNT OF FILES FOR CONTROL ALGO
*       IBMCC                 -> OPTION 1= IBMCC 0= NONIBMCC
*       PAGESTART             -> PATTERN FOR START OF PAGE
*       MACHINE_INPUT_ARG_3   -> SET BY INIT
*       MACHINE               -> SUN/UNIX/IBM
*
END
      DEFINE("OPENIN(FILENAME)IOVARNAME")          :(END_OPENIN)
OPENIN
+     IDENT(MACHINE,"IBM")                  :S(NOMINUS_OPENIN)
      FILENAME "-"                        :F(NOMINUS_OPENIN)
      FILENAME = " " FILENAME
      OUTLISTING = OUTLISTING_MSG "FILENAME < " FILENAME
+           "> BEGINS WITH '-' FILE DESCRIPTOR ASSUMED"
NOMINUS_OPENIN
+     OPENIN = DIFFER(READAPAGE_MASTERTABLE< FILENAME> )
+           RAPN_IOVARNAME(READAPAGE_MASTERTABLE< FILENAME> )
+                                 :S(RETURN)
      OPENIN_GENSYM_COUNTER = OPENIN_GENSYM_COUNTER + 1
      IOVARNAME = "INASOCVAR" OPENIN_GENSYM_COUNTER
      OPENIN = IOVARNAME
      READAPAGE_MASTERTABLE< FILENAME> =
+          READAPAGE_NODE(IOVARNAME,0,NULL,
+               IBMCC,PAGESTART,
+               0,NULL)
      OPENINPUTFILES = OPENINPUTFILES + 1
      IDENT(MACHINE,"IBM")                  :S(IBM_OPENIN)
      OUTPUT = PUT("COLLECT()")
      INPUT(IOVARNAME,IOVARNAME,FILENAME)   :S(RETURN_OPENIN)
      OUTLISTING = OUTLISTING_MSG "HAVING PROBLEMS OPENING FILE: "
+          FILENAME
      OUTPUT = "HAVING PROBLEMS OPENING FILE: " FILENAME
      INPUT(IOVARNAME,IOVARNAME,FILENAME)   :S(RETURN_OPENIN)
BADOPEN_OPENIN
+     RAPN_EOF(READAPAGE_MASTERTABLE< FILENAME> ) = "EOF"
      OPENINPUTFILES = OPENINPUTFILES - 1
      OUTLISTING = OUTLISTING_ERROR "CANT OPEN FILE: " FILENAME
      OUTPUT = "ERROR - CANT OPEN FILE: " FILENAME   :(FRETURN)
IBM_OPENIN
+     INPUT(IOVARNAME,FILENAME)   :F(BADOPEN_OPENIN)
RETURN_OPENIN
      OUTLISTING = OUTLISTING_MSG "OPENED FILE: " FILENAME
      OUTPUT = "OPENED FILE: " FILENAME          :(RETURN)
END_OPENIN

-STITL      PADIT

      DEFINE('PADIT(PAGE,STR,WHERE,COUNT)CNT')
```

```
+     :(ENDPADIT)
PADIT
      CNT = 0
      PADIT = PAGE
PADIT1 CNT = ?(PAGE< CNT + 1> ) CNT + 1 :F(RETURN)
      IDENT(PAGE< CNT> ,BOL)   :S(RETURN)
      PAGE< CNT> = IDENT(WHERE,'RIGHT') PAGE< CNT>
+      DUPL(STR,COUNT) :S(PADIT1)
      PAGE< CNT> = IDENT(WHERE,'LEFT') DUPL(STR,COUNT)
+      PAGE< CNT>  :(PADIT1)
ENDPADIT

-STITL       PATTERNS

      DEFINE('PATTERNS()')  :(ENDPATTERNS)
PATTERNS
      &ANCHOR = 0
      ALPHA = 'ABCDEFGHIJKLMNOPQRSTUVWXYZ'
      UNQALPHA = &ALPHABET
      DIGITS = '0123456789'
      NUMBER = SPAN(DIGITS)
      NUMBERS = NUMBER | '*'
      NAME = ANY(ALPHA) ( SPAN(DIGITS ALPHA) | NULL )
      WORD = SPAN(DIGITS ALPHA)
      FILEWORD = SPAN(DIGITS ALPHA '/')
      BLANK = ' '
      TAB = IDENT(MACHINE,"IBM")  SUBSTR(&ALPHABET,6,1)
      TAB = DIFFER(MACHINE,"IBM") SUBSTR(&ALPHABET,10,1)
      BT = SPAN('    ')
      HBT = SPAN('   -')
      BTN = BT | NULL
      UNQALPHA '"' =
      UNQALPHA "'" =
      UNQBETA = UNQALPHA
      UNQBETA '(' =
      UNQBETA ')' =
      UNQBETA ';' =
      UNQGAMMA = UNQBETA
      UNQGAMMA ',' =
      &ANCHOR = DEFAULTANCHOR
      DLITERAL = '"' (NULL | SPAN(UNQALPHA "'")) '"'
      SLITERAL = "'" (NULL | SPAN(UNQALPHA '"')) "'"
      ELITERAL = SLITERAL | DLITERAL
      BASEEXP = SPAN(UNQBETA) | ELITERAL |
+      "(" ARBNO(*BASEEXP) ")"
      FULLEXP = BASEEXP ARBNO(BASEEXP)
      SMERGE = 'SIDE' HBT 'BY' HBT 'SIDE'
      OMERGE = 'ONE' HBT 'AFTER' HBT 'ANOTHER'
      LMERGE = 'LINE' HBT 'BY' HBT 'LINE'
      ALLMERGES = SMERGE | OMERGE | LMERGE
      NLITERAL = BT ELITERAL
      LLITERAL = ELITERAL ARBNO(NLITERAL)
      BASEEXP1 = SPAN(UNQGAMMA) | ELITERAL | ARBNO(*BASEEXP1)
****  BASEEXP2 = "(" BASEEXP1 ")"
      ENDOFDEF = BTN ( ANY(";") | RPOS(0) )
      VERB = 'REPLACE' BT 'EVERYTHING' BT 'BUT' |
```

```
      +        'REPLACE' | 'CHOOSE' | 'REMOVE'
      +        | 'TRANSFORM' ( BT 'EVERYTHING' BT 'BUT' | NULL )
           COMMENT = '*'
           COMPILETIME = '@'
           INITTIME = '<'
           ENDTIME = '>'
           INWSTIME = '='
           COORDPAIRS = BTN '(' BTN NUMBERS . SVS1 BTN ','
      +     BTN NUMBERS . SVS2 BTN '-' BTN NUMBERS . SVS3 BTN ')' BTN
           MONTHS = 'JANUARY' | 'FEBRUARY' | 'MARCH' | 'APRIL' |
      +     'MAY' | 'JUNE' | 'JULY' | 'AUGUST' | 'SEPTEMBER' |
      +     'OCTOBER' | 'NOVEMBER' | 'DECEMBER' | ('JAN' | 'FEB' |
      +     'MAR' | 'APR' | 'JUL' | 'JUN' | 'AUG' | 'SEP' | 'SEPT' |
      +     'OCT' | 'NOV' | 'DEC') ('.' | NULL)
           YEARS = ANY(DIGITS) ANY(DIGITS) ANY(DIGITS) ANY(DIGITS)
           DAYS = (ANY('012') | NULL) ANY(DIGITS) | '3' ('1' | '0')
           NMON = ('0' ANY(DIGITS)) | '11' | '12' | ANY('123456789')
           NYEAR = ANY(DIGITS) ANY(DIGITS)
           NDATES = NMON '/' (DAYS '/' | NULL) NYEAR |
      +      NMON '-' (DAYS '-' | NULL) NYEAR
           TIMES = (ANY('012') | NULL) ANY(DIGITS) ':' ANY('012345')
      +     ANY(DIGITS) ( ':' ANY('012345') ANY(DIGITS) | NULL)
           MANYDATES = NDATES | MONTHS BT DAYS ',' BT YEARS
           MANYDATESANDTIMES = MANYDATES | TIMES
           ALLDATESANDTIMES = MANYDATESANDTIMES
           TRIDATE = ANY(DIGITS) ANY(DIGITS) "/" ANY(DIGITS)
      +     ANY(DIGITS) "/" ANY(DIGITS) ANY(DIGITS)
           TRITIME = ANY(DIGITS) ANY(DIGITS) ":" ANY(DIGITS)
      +     ANY(DIGITS) (":" ANY(DIGITS) ANY(DIGITS) | NULL)
           TRIDATEORTIME = TRIDATE | TRITIME
           TD = DATE()
           TD NUMBER . MOND '/' NUMBER . DAYD '/' NUMBER . YEARD
           MOND = SIZE(MOND,1) '0' MOND
           DAYD = SIZE(DAYD,1) '0' DAYD
           YEARD = SIZE(YEARD,1) '0' YEARD
           TODAY = MOND ('-' | '/') (DAYD ('-' | '/') | NULL) YEARD
      *
           DEFERPATBASE = 'COLUMNS' | 'LINES' | 'STRINGS'
           DEFERPAGEPAT = 'PAGES' | 'MESSAGES' | 'SCREENS'
           DEFERPAT = DEFERPATBASE | DEFERPAGEPAT
           PATSHAPES = 'LINES' | 'COLUMNS' | 'STRINGS' | 'BOXES'
           NUMSHAPES = 'LINES' | 'COLUMNS'
           COOSHAPES = 'STRINGS' | 'BOXES'
      *
           PAGERNGPAT = DEFERPAGEPAT
      +     BT 'FROM' HBT 'NUMBER' BTN '(' BTN
      +     NUMBER . RNGFROM BTN ')' BT 'TO' HBT 'NUMBER' BTN
      +     '(' BTN NUMBER . RNGTO BTN ')'
      *
           NUMPAT = NUMSHAPES . NTSHAP
      +     BT 'FROM' HBT 'NUMBER' BTN '(' BTN
      +     NUMBER . LEMON1 BTN ')' BT 'TO' HBT 'NUMBER' BTN
      +     '(' BTN NUMBER . LEMON2 BTN ')'
      *
           PATPAT = PATSHAPES . TSHAP
      +     BT 'FROM' HBT 'PATTERN' BTN '(' BTN FULLEXP . P1 BTN ')' BT
```

```
    +   'TO' HBT 'PATTERN' BTN '(' BTN FULLEXP . P2 BTN ')'
35  *
    EPATPAT = PATSHAPES . TSHAP
    +   BT 'FROM' HBT 'EVERY' HBT 'PATTERN' BTN '(' BTN
    +   FULLEXP . P1 BTN ')' BT 'TO' HBT 'EVERY' HBT 'PATTERN'
    +   BTN '(' BTN FULLEXP . P2 BTN ')'
40  *
    COOPAT = COOSHAPES . CTSHAP BT 'FROM' HBT 'COORD'
    +   BTN '(' BTN NUMBER . LEMON1 BTN ',' BTN NUMBER . LEMON2
    +   BTN ')' BT 'TO' HBT 'COORD' BTN '(' BTN NUMBER . LEMON3
    +   BTN ',' BTN NUMBER . LEMON4 BTN ')'
45  *
    BLOCKPAT = 'BLOCKS' BT 'SEGMENTS' BTN '(' BTN
    +   (COORDPAIRS ARBNO(COORDPAIRS)) . SEGM BTN ')'
    *
    CPATPAT = 'CLOUDS' BT 'PATTERN' BTN '(' BTN
50  +   FULLEXP . CLOUDPAT BTN ')'

    WHEREPAT = ( 'WHERE' | 'WHEN' )

    *   BASESHAPE = ALL OF THE ABOVE QUALIFIEDS
    BASESHAPE = NUMPAT | COOPAT | PATPAT | EPATPAT |
    +   BLOCKPAT | CPATPAT
    *   SHAPE1 = BASESHAPES + DEFERREDS + PAGERNGPAT
 5  SHAPE1 = BASESHAPE | DEFERPAT | PAGERNGPAT
    *   SHAPE2 = ALL OF THE ABOVE PLUS THEY
    SHAPE2 = BASESHAPE | 'THEY' | DEFERPAT
    OPTWHERENOTEMPTYPAT =
    +           ( ( BT WHEREPAT BT 'NOT' BT 'EMPTY' ) | NULL )
10  EOLPAT = BTN ";" BTN RPOS(0)
    ACTSTMT1 =
    +   BTN VERB . VB BT *SHAPE1 . S1 BT 'WITH' BT
    +   *FULLEXP . WITH BT WHEREPAT (BT 'LEFTOVERS' BT 'OF' | NULL)
    +   . EVB BT *SHAPE2 . S2 BT ('CONTAIN' |
15  +   'DO' BT 'NOT' BT 'CONTAIN') . CONT BT *FULLEXP . PATT
    +   EOLPAT
    *
    ACTSTMT2 =
    +   BTN VERB . VB BT *SHAPE1 . S1 BT WHEREPAT (BT 'LEFTOVERS' BT
20  +   'OF' | NULL) . EVB BT *SHAPE2 . S2 BT ('CONTAIN' |
    +   'DO' BT 'NOT' BT 'CONTAIN') . CONT BT *FULLEXP . PATT
    +   EOLPAT
    *
    ACTSTMT3 =
25  +   BTN VERB . VB BT *SHAPE1 . S1 BT 'WITH' BT
    +   *FULLEXP . WITH
    +   EOLPAT
    *
    ACTSTMT4 =
30  +   BTN VERB . VB BT *SHAPE1 . S1 EOLPAT
    *
    ACTSTMT = ACTSTMT1 | ACTSTMT2 | ACTSTMT3 | ACTSTMT4
    *
    DEFSTMT = BTN 'DEFINE' BT (NAME . WSET) BT 'USING' BT
35  +   (ARB . USINGS.) EOLPAT
    ENDSTMT = BTN 'END' BT (NAME . EWSET) EOLPAT
    PRSTMT = BTN 'PRINT' BT 'TO' BT '(' BTN FILEWORD . DD BTN
```

```
    +     ')' EOLPAT
          TRSTMT = BTN 'TRANSLATE' BT 'FROM' BT LLITERAL . STR1
40  +     BT 'TO' BT LLITERAL . STR2 EOLPAT
          PADSTMT = BTN 'PAD' BT 'ON' BT 'THE' BT ('LEFT' | 'RIGHT')
    +     . DIRECTION BT 'WITH' BT NUMBER . HOWMANY BT
    +     LLITERAL . STR EOLPAT
          REMSTMT = BTN 'REMEMBER' BT 'AS' BT NAME . NAMEIT
45  +     OPTWHERENOTEMPTYPAT . REMEMP
    +     EOLPAT
          WRSTMT = BTN 'WRITE' BT LLITERAL . STR BT
    +     'TO' BT '(' BTN NAME . NAMEIT BTN ')'
    +     EOLPAT
50        MRGSTMT = BTN 'MERGE' BT ALLMERGES . MRGTYPE
    +     BT ( "(" BTN STNAME BTN ")" | STNAME ) . MOBJ1
    +     BTN "," BTN ( "(" BTN STNAME BTN ")" | STNAME ) . MOBJ2
    +     OPTWHERENOTEMPTYPAT . MRGEMP
    +     EOLPAT
          COMPSTMT = BTN 'COMPARE' HBT 'PRINT' BT NAME . COMPNAME
    +     BT 'WHERE'
5   +     BT 'OLD' BT 'FILE' BT 'IS' BT '(' BTN FILEWORD . OLDDD BTN ')'
    +     BT 'NEW' BT 'FILE' BT 'IS' BT '(' BTN FILEWORD . NEWDD BTN ')'
    +     BT 'DIFFERENCE'
    +          BT 'FILE' BT 'IS' BT '(' BTN FILEWORD . DIFFDD BTN ')'
    +     EOLPAT
10        INTERSTMT = BTN 'INTERSPERSE' HBT 'PRINT' BT NAME .
    +     INAME BT 'WHERE' BT 'INPUT' BT 'FILE'
    +     BT 'IS' BT '(' BTN NAME . ININTER BTN ')' BT 'OUTPUT'
    +     BT 'FILE' BT 'IS' BT '(' BTN NAME . OUTINTER BTN ')' BT
    +     'MERGE' HBT 'TYPE' BT 'IS' BT ALLMERGES . MRGTYPE BT
15  +     ('REVERSED' . REVERSED BT | NULL) 'WORKING' BT 'SET' BT
    +     'KEY' BT 'SEGMENT' BT 'IS' BT COORDPAIRS . KEYINTER
    +     BT 'FILE' BT 'KEY' BT
    +     'SEGMENT' BT 'IS' BT COORDPAIRS . KEY2INTER
    +     EOLPAT  :(RETURN)
20  ENDPATTERNS

    -STITL  PARSEGEN FUNCTION --I--

        DEFINE('PARSEGEN()')                    :(END_PARSEGEN)
    PARSEGEN
    *     IF DESIRED, PUT A CHECK FOR STRING AS OPPOSED TO EXPRESSIONS
25  *           FOR NON-CLOUDS AND NON-EVAL REPLACES
    IN_PARSEGEN
    +     STMT = GETSTMT()                      :F(RETURN)
          STMT COMMENT                          :S(IN_PARSEGEN)
          STMT COMPILETIME =                    :F(INITSTUFF1_PARSEGEN)
30        YUPI = CODE(STMT ':(IN_PARSEGEN)')    :S< YUPI> F(IN_PARSEGEN)
    INITSTUFF1_PARSEGEN
    +     STMT INITTIME =                       :F(ENDSTUFF1_PARSEGEN)
          INITCODE = INITCODE STMT              :(IN_PARSEGEN)
    ENDSTUFF1_PARSEGEN
35  +     STMT ENDTIME =                        :F(DEF_PARSEGEN)
          ENDCODE = ENDCODE STMT                :(IN_PARSEGEN)
    DEF_PARSEGEN
    +     STMT DEFSTMT                          :S(FRSTDEF_PARSEGEN)
          OUTLISTING = OUTLISTING_ERROR
```

```
40 +              'STATEMENT BEFORE VALID DEFINE DISCARDED:'
   +                          :(IN_PARSEGEN)
   FRSTDEF_PARSEGEN
   +     CURWSET = WSET
         DEFSET(WSET,USINGS)
45 IN2_PARSEGEN
   +     STMT = GETSTMT()                :F(RETURN)
         STMT COMMENT                    :S(IN2_PARSEGEN)
         STMT COMPILETIME =              :F(INITSTUFF_PARSEGEN)
         YUPI = CODE(STMT ' :(IN2_PARSEGEN)')   :S< YUPI> F(IN2_PARSEGEN)
50 INITSTUFF_PARSEGEN
   +     STMT INITTIME =                 :F(ENDSTUFF_PARSEGEN)
         INITCODE = INITCODE STMT        :(IN2_PARSEGEN)
   ENDSTUFF_PARSEGEN
   +     STMT ENDTIME =                  :F(WSSTUFF_PARSEGEN)
5        ENDCODE = ENDCODE STMT          :(IN2_PARSEGEN)
   WSSTUFF_PARSEGEN
   +     STMT INWSTIME =                 :F(PRSTUFF_PARSEGEN)
         NONCOMP< CURWSET> = NONCOMP< CURWSET> STMT :(IN2_PARSEGEN)
   PRSTUFF_PARSEGEN
10 +     STMT PRSTMT                     :F(ISEND_PARSEGEN)
         IDENT(OUTFILETAB< DD> ,NULL)    :F(PR_PARSEGEN)
         OUTFILETAB< DD> = 'OPEN'
         IDENT(MACHINE,'IBM') OUTPUT(DD 'XXXXX',DD)
         DIFFER(MACHINE,'IBM') OUTPUT(DD 'XXXXX',DD 'XXXXX',DD ' -W')
15 PR_PARSEGEN
   +     NONCOMP< CURWSET> = NONCOMP< CURWSET> ' PRINTPAGE(PAGE,'"
   +           DD 'XXXXX');'
   +                          :(IN2_PARSEGEN)
   ISEND_PARSEGEN
20 +     STMT ENDSTMT                    :F(ISACT_PARSEGEN)
         ENDSET(EWSET)                   :(IN2_PARSEGEN)
   ISACT_PARSEGEN
   +     EVB = NULL
         STMT ACTSTMT                    :F(ISDEF_PARSEGEN)
25       S1 BTN PAGERNGPAT               :F(BUILDC_PARSEGEN)
         IDENT(S2,NULL)                  :S(BUILDC_PARSEGEN)
         OUTLISTING = OUTLISTING_ERROR
   +           'CONTAIN CLAUSE FOR PAGE/MESSAGE RANGE DELETED'
         PATT = NULL
30       CONT = NULL
         S2 = NULL
          MATCH(DEFERPAT RPOS(0),S2)  (MATCH(DEFERPAT RPOS(0),SH1)
   +           IDENT(SH2,'THEY'))      :S(BUILDC_PARSEGEN)
         IDENT(EVB,NULL)                 :S(BUILDC_PARSEGEN)
35       OUTLISTING = OUTLISTING_ERROR
   +           '*LEFTOVERS OF* IN DEFERRED 2ND SHAPE DELETED'
         EVB = NULL
   BUILDC_PARSEGEN
   +     BUILDCODE(CURWSET,VB,S1,EVB,S2,WITH,CONT,PATT) :(IN2_PARSEGEN)
40 ISDEF_PARSEGEN
   +     STMT DEFSTMT                    :F(TRSTMT_PARSEGEN)
         IDENT(CURWSET,NULL)             :S(YESDEF_PARSEGEN)
         OUTLISTING = OUTLISTING_ERROR
   +           'ATTEMPT TO DEFINE WITHOUT ENDING: END GENERATED'
```

```
*     ENDSET(CURWSET,NULL)
      ENDSET(CURWSET)
***   CURWSET = WSET
YESDEF_PARSEGEN
+     DEFSET(WSET,USINGS)
      CURWSET = WSET                    :(IN2_PARSEGEN)
TRSTMT_PARSEGEN
+     STMT TRSTMT                       :F(PADSTMT_PARSEGEN)
      NONCOMP< CURWSET> = NONCOMP< CURWSET>
+       ' PAGE = NOTNULLPG(PAGE) TRANSL(PAGE,' STR1 ',' STR2 ');'
+                                       :(IN2_PARSEGEN)
PADSTMT_PARSEGEN
+     STMT PADSTMT                      :F(REMSTMT_PARSEGEN)
      NONCOMP< CURWSET> = NONCOMP< CURWSET>
+       ' PAGE = NOTNULLPG(PAGE) PADIT(PAGE,' STR ',"
+       DIRECTION "',' HOWMANY ');'
+                                       :(IN2_PARSEGEN)
REMSTMT_PARSEGEN
+     STMT REMSTMT                      :F(WRSTMT_PARSEGEN)
      NONCOMP< CURWSET> = IDENT(REMEMP,NULL) NONCOMP< CURWSET>
+       ' REMEMBERY< '" NAMEIT '"> = COPY(PAGE);' :S(IN2_PARSEGEN)
      NONCOMP< CURWSET> = NONCOMP< CURWSET>
+       ' REMEMBERY< '" NAMEIT '"> = NOTNULLPG(PAGE) COPY(PAGE);'
+                                       :S(IN2_PARSEGEN)
*     WRITE ASSUMES FILE IS OPEN
WRSTMT_PARSEGEN
+     STMT WRSTMT                       :F(MRGSTMT_PARSEGEN)
      IDENT(OUTFILETAB< NAMEIT> ,NULL)        :F(WRSTMT2_PARSEGEN)
      OUTFILETAB< NAMEIT> = 'WRITE'
      IDENT(MACHINE,'IBM') OUTPUT(NAMEIT 'XXXXX',NAMEIT)
      DIFFER(MACHINE,'IBM') OUTPUT(NAMEIT 'XXXXX',
+                   NAMEIT 'XXXXX',NAMEIT ' -W')
WRSTMT2_PARSEGEN
+     NONCOMP< CURWSET> = NONCOMP< CURWSET> ' ' NAMEIT 'XXXXX'
+       ' = '" STR '";'                 :(IN2_PARSEGEN)
MRGSTMT_PARSEGEN
+     STMT MRGSTMT                      :F(COMPSTMT_PARSEGEN)
* PATTERN SETS: MRGTYPE MOBJ1 MOBJ2 MRGEMP
      BUILDMERGE(CURWSET,MRGTYPE,MOBJ1,MOBJ2,MRGEMP)
+                                       :(IN2_PARSEGEN)
COMPSTMT_PARSEGEN
+     STMT COMPSTMT                     :F(INTERSTMT_PARSEGEN)
      IDENT(NONUSINGINS< OLDDD> ,NULL)        :F(COMPST0_PARSEGEN)
      NONUSINGINS< OLDDD> = 'COMPARE'
      OPENIN(OLDDD)
COMPST0_PARSEGEN
+     IDENT(OUTFILETAB< NEWDD> ,NULL)         :F(COMPST1_PARSEGEN)
      OUTFILETAB< NEWDD> = 'COMPARE'
      IDENT(MACHINE,'IBM') OUTPUT(NEWDD 'XXXXX',NEWDD)
      DIFFER(MACHINE,'IBM') OUTPUT(NEWDD 'XXXXX',NEWDD 'XXXXX',
+     NEWDD ' -W')
COMPST1_PARSEGEN
+     NONCOMP< CURWSET> = NONCOMP< CURWSET> ' PRINTPAGE(PAGE,"
+                   NEWDD 'XXXXX');'
      IDENT(OUTFILETAB< DIFFDD> ,NULL)        :F(COMPST2_PARSEGEN)
      OUTFILETAB< DIFFDD> = 'COMPARE'
      IDENT(MACHINE,'IBM') OUTPUT(DIFFDD 'XXXXX',DIFFDD)
```

```
50      DIFFER(MACHINE,'IBM') OUTPUT(DIFFDD 'XXXXX',
+       DIFFDD 'XXXXX',DIFFDD ' -W')
COMPST2_PARSEGEN
+       NONCOMP< CURWSET> = NONCOMP< CURWSET>
+           ' (IDENT(PAGE< 1> ,BOL) DIFFER(PAGE< 0> ,EOF)) '
+           ' COMPAIRE(PAGE,READFORCOMPS('"
+             OLDDD "),'" DIFFDD 'XXXXX","' COMPNAME '");'
5 +                          :(IN2_PARSEGEN)
INTERSTMT_PARSEGEN
+       STMT INTERSTMT                :F(BADSTMT_PARSEGEN)
        IDENT(NONUSINGINS< ININTER> ,NULL) :F(INTERST1_PARSEGEN)
        NONUSINGINS< ININTER> = 'INTER'
10      OPENIN(ININTER)
INTERST1_PARSEGEN
+       IDENT(OUTFILETAB< OUTINTER> ,NULL)      :F(INTERST2_PARSEGEN)
        OUTFILETAB< OUTINTER> = 'INTER'
        IDENT(MACHINE,'IBM') OUTPUT(OUTINTER 'XXXXX',OUTINTER)
15      DIFFER(MACHINE,'IBM') OUTPUT(OUTINTER 'XXXXX',
+         OUTINTER 'XXXXX',OUTINTER ' -W')
INTERST2_PARSEGEN
+       BUILDINTERSPERSE(ININTER 'NNNNN',OUTINTER 'XXXXX',
+       KEYINTER,KEY2INTER,MRGTYPE,INAME,CURWSET,REVERSED)
20 +                          :(IN2_PARSEGEN)
BADSTMT_PARSEGEN
+       OUTLISTING = OUTLISTING_ERROR
+             ' INVALID STATEMENT: ' STMT :(IN2_PARSEGEN)
END_PARSEGEN

25 -STITL      PRINTPAGE

       DEFINE('PRINTPAGE(PTR,DD,CCVAL,CCTOP)COUNTER,CC')
+                          :(ENDPRINTPAGE)
PRINTPAGE
       CC = CCTOP
30     CCVAL = IDENT(IBMCC,1) " "
       CC = IDENT(IBMCC,1) '1'
       COUNTER = 1
       IDENT(PTR,NULL)                :S(RETURN)
NEXTOUT IDENT(PTR< COUNTER> ,BOL)          :S(RETURN)
35     $DD = CC PTR< COUNTER>
       CC = IDENT(IBMCC,1) CCVAL
       COUNTER = ?(PTR< COUNTER + 1> ) COUNTER + 1 :S(NEXTOUT)F(RETURN)
ENDPRINTPAGE

-STITL      PROCESS PROGRAM

40     DEFINE('PROCESS()I') :(ENDPROCESS_PROCESS)
PROCESS
*
*      GENERATE FINAL END IF NECESSARY
*
45 GEN_END_PROCESS
+      IDENT(CURWSET)          :S(INIT_CODE_PROCESS)
       OUTLISTING = OUTLISTING_MSG 'FINAL END GENERATED'
       ENDSET(CURWSET)
```

```
*
*     PEFORM INITIAL CODE, IF ANY
*
INIT_CODE_PROCESS
+     COMPINITCODE_PROCESS = DIFFER(INITCODE,NULL)
+     CODE(INITCODE ' :(PREPARE_PROCESS)')
+     :S< COMPINITCODE_PROCESS>
*
*     PREPARE CONTROL ARRAY FOR PROCESSING
*
PREPARE_PROCESS
+     INPUTARRAY = CONVERT(INPUTTAB,'ARRAY')
      I = 1
OPEN_PROCESS
+     OPENIN(INPUTARRAY< I,1> )
      I = ?(INPUTARRAY< I + 1, 1> ) I + 1 :S(OPEN_PROCESS)
      OUTPUT = PUT("INPUTARRAY< 1,1> ")
      OUTPUT = PUT("OPENINPUTFILES")
      I = 0
START_READING_PROCESS
+     LE(OPENINPUTFILES,0)        :S(ENDCODE_PROCESS)
      I = I + 1
      IDENT(DEFAULTREAD,'ROUNDROBIN') :S(ROUNDCODE_PROCESS)
      GT(I,MAXFILE)               :S(PASSEOFPRE_PROCESS)
      ?(INPUTARRAY< I,1> )        :F(PASSEOFPRE_PROCESS)
      IDENT(INPUTARRAY< I,1> ,NULL)
+           :S(PASSEOFPRE_PROCESS)F(CALLFILEROUT_PROCESS)
ROUNDCODE_PROCESS
+      I = GT(I,MAXFILE) 1
       I =  (?(INPUTARRAY< I,1> )) 1
       I = IDENT(INPUTARRAY< I,1> ,NULL) 1
CALLFILEROUT_PROCESS
+     FILEROUTINE()   :(START_READING_PROCESS)
*
*     IF END OF PROCESSING MAY HAVE BEEN REACHED
*     DURING NON-ROUNDROBIN PROCESSING
*
PASSEOFPRE_PROCESS
      I = 1
      DEFAULTREAD = 'ROUNDROBIN'
      PASSINGEOFS = 'YES'
*
*     KEEP LOOPING UNTIL ALL FILES ARE CLOSED
*
PASSEOF_PROCESS
+     FILEROUTINE()
      LE(OPENINPUTFILES,0)  :S(ENDCODE_PROCESS)
      I = LT(I,MAXFILE) ?(INPUTARRAY< I + 1,1> )
+     DIFFER(INPUTARRAY< I + 1,1> ,NULL)
+     I + 1 :S(PASSEOF_PROCESS)
      I = 1 :(PASSEOF_PROCESS)
*
*  DO END OF PHASER PROGRAM CODE
*
ENDCODE_PROCESS
      COMPENDCODE_PROCESS = DIFFER(ENDCODE,NULL)
```

```
5 +     CODE(ENDCODE ' :(RETURN)')
  +           :S< COMPENDCODE_PROCESS> F(RETURN)
  ENDPROCESS_PROCESS

  -STITL              PUT - PUT.S

  PUT
10 +      PUT = S ":< " EVAL(S) "> " :(RETURN)
  END_PUT

  -STITL        READAPAGE - READAPAGE.S

  * READAPAGE(FILENAME)
  *     READAPAGE WILL RETURN THE NEXT PAGE FROM THE FILENAME FILE.
15 *     THE FILES ARE INDEXED IN A TABLE BY THE FILENAME'S.
  *
  *     IF PRIOR EOF THEN IT WILL FRETURN, OTHERWISE IT RETURNS THE PAGE.
  *
  *     THE FOLLOWING GLOBALS ARE USED:
20 *       READAPAGE_MASTERTABLE  -> TABLE OF DATASTRUCTURES
  *                         READAPAGE_NODE, ONE
  *                         PER FILE. SET IN OPENIN.
  *       OPENINPUTFILES        -> NUMBER OF CURRENTLY OPEN FILES,
  *                         DECREMENTED HERE, INCREMENTED IN
25 *                         OPENIN.
  *       BOL                -> END OF PAGE MARKER.
  *       NULLPAGE             -> AN EMPTY PAGE.
  *       PAGESIZE             -> MAX PAGE SIZE.
  *       READAPAGE_NODE        -> DATASTRUCTURE, WITH FIELDS:
30 *         RAPN_IOVARNAME     -> NAME OF INPUT ASSOCIATED VARIABLE
  *         RAPN_PAGENO        -> CURRENT PAGE NUMBER
  *         RAPN_LINE          -> LINE BUFFER FOR PAGE OVERFLOW
  *         RAPN_IBMCC         -> IS IBMCC ON OR OFF ?
  *         RAPN_PAGESTART     -> PATTERN FOR START OF PAGE
35 *         RAPN_BLANKCOUNT    -> NUMBER OF BLANK LINES IN BUFFER
  *         RAPN_EOF           -> IF NON-NULL THEN PRIOR EOF
      DEFINE("READAPAGE(FILENAME)RAPN,LINE,CC,LINENO,IOVARNAME"
  +           ",PAGESTART,BUFF,BLANKCOUNT")  :(END_READAPAGE)
  READAPAGE
40 +      RAPN = READAPAGE_MASTERTABLE< FILENAME>
      IDENT(RAPN)                    :F(OKTABLEENT_READAPAGE)
      OUTLISTING = OUTLISTING_ERROR
  +         "INTERNAL ERROR ATTEMPT TO READ FROM FILENAME: "
  +           FILENAME " FILE NOT OPEN - OPENING !!"
45    OPENIN(FILENAME)                 :(READAPAGE)
  OKTABLEENT_READAPAGE
  +     PAGESTART = RAPN_PAGESTART(RAPN)
      BUFF = RAPN_LINE(RAPN)
      BLANKCOUNT = RAPN_BLANKCOUNT(RAPN)
      READAPAGE = COPY(NULLARRAY)
      IOVARNAME = RAPN_IOVARNAME(RAPN)
  **************************************************:(READLOOP_READAPAGE)
 5 READLOOP_READAPAGE
      LINE = GT(BLANKCOUNT,0) BLANKLINE     :F(NOTBLANK_READAPAGE)
      BLANKCOUNT = BLANKCOUNT - 1          :(TESTSTART_READAPAGE)
  NOTBLANK_READAPAGE
  +     IDENT(RAPN_EOF(RAPN))              :F(FRETURN)
```

```
    LINE = DIFFER(BUFF) BUFF
+                           :F(FROMFILE_READAPAGE)
    BUFF = NULL                 :(GOTLINE_READAPAGE)
FROMFILE_READAPAGE
+   LINE = $IOVARNAME           :S(NOTEOF_READAPAGE)
    RAPN_EOF(RAPN) = "EOF"      :(EOF_READAPAGE)

NOTEOF_READAPAGE
+   EQ(RAPN_IBMCC(RAPN),1)      :F(TESTSTART_READAPAGE)
    LINE LEN(1) . CC =          :F(GOTLINE_READAPAGE)
    IDENT(CC," ")               :S(TESTSTART_READAPAGE)
    IDENT(CC,"1")               :S(EOP_READAPAGE)
    IDENT(CC,"+ ")              :S(READLOOP_READAPAGE)
    DIFFER(CC,"0")              :S(NOT0_READAPAGE)
    BUFF = LINE
    LINE = BLANKLINE            :(TESTSTART_READAPAGE)

NOT0_READAPAGE
+   BUFF = IDENT(CC,"-") LINE   :F(TESTSTART_READAPAGE)
    LINE = BLANKLINE
    BLANKCOUNT = 1

TESTSTART_READAPAGE
+   LINE POS(0) PAGESTART  :F(GOTLINE_READAPAGE)

EOP_READAPAGE
*+  EQ(LINENO,0) EQ(RAPN_PAGENO(RAPN),0)  :S(GOTLINE_READAPAGE)
    EQ(LINENO,0)                :S(GOTLINE_READAPAGE)

OVERFLOW_READAPAGE
+   RAPN_PAGENO(RAPN) = RAPN_PAGENO(RAPN) + 1
    BUFF = LINE                 :(RETURN_READAPAGE)

GOTLINE_READAPAGE
+   LINENO = LINENO + 1
    READAPAGE = (READAPAGE< LINENO> ) ENLARGEPAGE(READAPAGE)
    READAPAGE< LINENO> = LINE   :(READLOOP_READAPAGE)

EOF_READAPAGE
+   RAPN_LINE(RAPN) = BUFF
    RAPN_BLANKCOUNT(RAPN) = BLANKCOUNT
    OPENINPUTFILES = OPENINPUTFILES - 1
    EQ(LINENO,0)                :S(FRETURN)
    OUTLISTING = OUTLISTING_MSG "END OF FILE "
+           " PAGENO: " LPAD(RAPN_PAGENO(RAPN) + 1,6)
+           " FILE: "  FILENAME
RETURN_READAPAGE
+   RAPN_LINE(RAPN) = BUFF
    READAPAGE< LINENO + 1> = BOL    :(RETURN)
END_READAPAGE

-STITL   READORNULL -- READORNULL.S

    DEFINE('READORNULL(DD2)') :(END_READORNULL)
READORNULL
+   IDENT(PASSINGEOFS,'YES')    :S(EOF_READORNULL)
    READORNULL = READAPAGE(DD2)  :S(RETURN)
```

```
EOF_READORNULL
+     READORNULL = COPY(EOFARRAY)    :(RETURN)
END_READORNULL

-STITL      READFORCOMPS

**                                    **
      DEFINE('READFORCOMPS(DD)') :(ENDREADFORCOMPS)
READFORCOMPS
      READFORCOMPS = READAPAGE(DD) :S(RETURN)
*     READFORCOMPS = COPY(NULLARRAY)    :(RETURN)
      READFORCOMPS = COPY(EOFARRAY)     :(RETURN)
ENDREADFORCOMPS

-STITL      ROUT

      DEFINE('ROUT(PAGE,DEPENDENT,CALLSTRING)LIST3OFDEP') :(END_ROUT)
ROUT
+     WSPGCOUNT< DEPENDENT> = NOTNULLPG(PAGE) WSPGCOUNT< DEPENDENT> + 1
*     OUTPUT = "ABOUT TO BRANCH"
*     OUTPUT = PUT("DEPENDENT")
*     OUTPUT = PUT("DATATYPE(CODETAB< DEPENDENT> )")
          :< CODETAB< DEPENDENT> >
BACK  LIST3OFDEP = TEMPASSO< DEPENDENT> :F(RETURN)
NDEP  LIST3OFDEP ';' WORD . DEP2 =    :F(RETURN)
      IDENT(LOOPCHECKING,'OFF')     :S(NOLOOP)
      ISALOOP()                 :F(NOLOOP)
      SIGLOOP()                 :(END)
NOLOOP CALLSTRING = ';' DEP2 CALLSTRING
      LIST3OFDEP ';' WORD :F(LASTONE)
      ROUT(COPY(PAGE),DEP2,CALLSTRING)      :(NDEP)
LASTONE ROUT(PAGE,DEP2,CALLSTRING)          :(NDEP)
END_ROUT

-STITL      SEGSFROMPATTERNS

      DEFINE('SEGSFROMPT(SHAPE,PAGE)TSHAP,P1,P2,CNT,'
+     'C1,CNT2,C2,TEMP1,TEMP2,TEMP3,TEMP4,HEAD,CURRENT')
+           :(ENDSEGSFROMPT)
SEGSFROMPT
      MATCH(PATPAT,SHAPE)  :F(BADSHAPEINSEGSFRPATT)
      P1 = EVAL(P1)
      P2 = EVAL(P2)
      &ANCHOR = 0
      CNT = 1
LSFP  (?(PAGE< CNT> ) DIFFER(PAGE< CNT> ,BOL)) :S(RETURN)
*     OUTPUT = 'P1 IS:' P1
      PAGE< CNT> @C1 P1 :S(FOUNDBEGIN)
*     OUTPUT = 'PAGE(' CNT ') IS:' PAGE< CNT>
      CNT = CNT + 1 :(LSFP)
FOUNDBEGIN
*     OUTPUT = 'FOUNDBEGIN- C1:' C1
      PAGE< CNT> P2 @C2 *GT(C2,C1) :S(FOUNDEND)
      CNT2 = CNT
LSFP2  (?(PAGE< CNT2> ) DIFFER(PAGE< CNT2> ,BOL)) :S(RETURN)
      PAGE< CNT2> P2 @C2 :S(FOUNDEND)
      CNT2 = CNT2 + 1 :(LSFP2)
```

```
FOUNDEND
*       OUTPUT = 'FOUND END- C2:' C2
        IDENT(TSHAP,'LINES') :S(FLINGO)
        IDENT(TSHAP,'COLUMNS') :S(FCOLGO)
        IDENT(TSHAP,'BOXES') :S(FBOXGO)
        IDENT(TSHAP,'STRINGS') :S(FSTRGO)
        :(BADSHAPEINSEGSFRPT)
FLINGO  TEMP1 = CNT
        TEMP2 = CNT2
        HEAD = SEGMENT(TEMP1,1,'*')
        SEGSFROMPT = HEAD
        CURRENT = HEAD
LOOPLN1 EQ(TEMP1,TEMP2)  :S(RETURN)
        TEMP1 = TEMP1 + 1
        NEXT(CURRENT) = SEGMENT(TEMP1,1,'*')
        CURRENT = NEXT(CURRENT) :(LOOPLN1)
FCOLGO  TEMP1 = C1 + 1
        TEMP2 = C2
*       IF TEMP2 < TEMP1 THEN THIS WILL PROBABLY NOT DO ANYTHING
        SEGSFROMPT = SEGMENT('*',TEMP1,TEMP2) :(RETURN)
FBOXGO  TEMP1 = CNT
        TEMP2 = C1 + 1
        TEMP3 = CNT2
        TEMP4 = C2
*       TEMP4 SHOULD BE GREATER THAN TEMP2
        HEAD = SEGMENT(TEMP1,TEMP2,TEMP4)
        SEGSFROMPT = HEAD
        CURRENT = HEAD
LOOPBX1 EQ(TEMP1,TEMP3) :S(RETURN)
        TEMP1 = TEMP1 + 1
        NEXT(CURRENT) = SEGMENT(TEMP1,TEMP2,TEMP4)
        CURRENT = NEXT(CURRENT) :(LOOPBX1)
FSTRGO  TEMP1 = CNT
        TEMP2 = C1 + 1
        TEMP4 = C2
        SEGSFROMPT = SEGMENT(TEMP1,TEMP2,TEMP4) :(RETURN)
ENDSEGSFROMPT

-STITL      SHAPESFROMSEGS

        DEFINE('SHAPESFROMSEGS(SH1,HEAD)HEAD2,CURRENT2,CURRENT'
+       'TONEWLIST,GREATER,LESS,OLDHEAD2')
+           :(ENDSHAPESFROMSEGS)
SHAPESFROMSEGS
        SHAPESFROMSEGS = IDENT(SH1,'STRINGS') HEAD :S(RETURN)
        IDENT(HEAD,NULL) :S(RETURN)
        IDENT(SH1,'LINES')    :F(BRCOLS)
        CURRENT = HEAD
        HEAD2 = SEGMENT(LINEN(CURRENT),1,'*')
        SHAPESFROMSEGS = HEAD2
        CURRENT2 = HEAD2
NEELEM  CURRENT = DIFFER(NEXT(CURRENT),NULL) NEXT(CURRENT)
+               :F(RETURN)
        NEXT(CURRENT2) = SEGMENT(LINEN(CURRENT),1,'*')
        CURRENT2 = NEXT(CURRENT2)  :(NEELEM)
BRCOLS
        IDENT(SH1,'COLUMNS') :F(BADSHAPEINSHFRSEGS)
```

```
        CURRENT = HEAD
        HEAD2 = SEGMENT('*',START(CURRENT),FINISH(CURRENT))
*       SHAPESFROMSEGS = HEAD2
        CURRENT2 = HEAD2
NEELEM2 CURRENT = DIFFER(NEXT(CURRENT),NULL) NEXT(CURRENT)
+               :F(SORDIT)
        NEXT(CURRENT2) = SEGMENT('*',START(CURRENT),FINISH(CURRENT))
        CURRENT2 = NEXT(CURRENT2) :(NEELEM2)
SORDIT  TONEWLIST = SEGMENT(0,0,0,HEAD2)
        HEAD2 = DIFFER(NEXT(HEAD2),NULL) NEXT(HEAD2) :F(STRIPHEAD)
        NEXT(NEXT(TONEWLIST)) = NULL
LOOOP1  LESS = TONEWLIST
        GREATER = NEXT(TONEWLIST)
LOOOP   IDENT(GREATER,NULL) :S(INSERT)
        LT(START(HEAD2),START(GREATER)) :S(INSERT)
        LESS = GREATER
        GREATER = NEXT(GREATER) :(LOOOP)
INSERT  OLDHEAD2 = HEAD2
        HEAD2 = NEXT(HEAD2)
        DIFFER(GREATER,NULL) EQ(START(OLDHEAD2),START(GREATER))
+       IDENT(FINISH(OLDHEAD2),FINISH(GREATER)) :S(SEND)
        NEXT(LESS) = OLDHEAD2
        NEXT(OLDHEAD2) = GREATER
SEND    IDENT(HEAD2,NULL) :F(LOOOP1)
STRIPHEAD
        TONEWLIST = NEXT(TONEWLIST)
        SHAPESFROMSEGS = TONEWLIST      :(RETURN)
ENDSHAPESFROMSEGS
-STITL      SIGLOOP

        DEFINE('SIGLOOP()')             :(ENDSIGLOOP)
SIGLOOP
        OUTLISTING = OUTLISTING_ERROR 'LOOP LOOP LOOP' :(RETURN)
ENDSIGLOOP

-STITL      TRANSL

        DEFINE('TRANSL(PAGE,STR1,STR2)CNT')
        :(ENDTRANSL)
TRANSL  CNT = 0
        TRANSL = PAGE
TRANS1  CNT = ?(PAGE< CNT + 1> ) CNT + 1 :F(RETURN)
        IDENT(PAGE< CNT> ,BOL)   :S(RETURN)
        PAGE< CNT> = REPLACE(PAGE< CNT> ,STR1,STR2) :(TRANS1)
ENDTRANSL

-STITL      MAIN PROGRAM

MAINPROGRAM
        INITIALIZE()
        PATTERNS()
        PARSEGEN()
        PROCESS()
END
```

What is claimed is:

1. In a data processing system producing a plurality of reports each comprising a plurality of pages, each said page comprising a plurality of lines of output text data, a post-processor for such text data comprising

means for selectively identifying two dimensional patterns of pluralities of portions of said lines of text data,

means for storing said patterns, and

means utilizing said stored patterns for processing said pages to produce modified additional reports,

said means for selectively identifying comprising

means for generating patterns to be matched to identify first portions of said pages,

means for generating starting and ending line and column specifications to identify second portions of said pages, and

means for representing said first portions and said second portions of said pages in a common format.

2. The post-processor according to claim 1 wherein said means for identifying comprises

means for selectively identifying pages, columns, lines, strings and blocks of data in said reports.

3. The post-processor according to claim 1 wherein said means for utilizing said stored patterns comprises

means for choosing, removing, replacing and replacing everything but said patterns.

4. In a data processing system producing a plurality of reports each comprising a plurality of pages, each said page comprising a plurality of lines of output text data, a method of processing such text data comprising the steps of

selectively identifying two dimensional patterns of a plurality of said lines of text data,

storing said patterns for later use, and

processing said pages utilizing said stored patterns to produce modified additional reports,

said step of selectively identifying comprising the steps of

generating patterns to be matched to identify first portions of said pages,

generating starting and ending line and column specifications of second portions of said pages, and

representing said first portions and said second portions of said pages in a common format.

5. The method according to claim 4 wherein said step of selectively identifying comprises the step of

identifying pages, columns, lines, strings and blocks of data in said reports.

6. The method according to claim 4 wherein said step of processing comprises the step of

choosing, removing, replacing or replacing everything but said so identified patterns.

* * * * *